1947.

QUEENSLAND

IMPERIAL MYCOLOGICAL INSTITUTE

FORTY-SEVENTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

REPORT OF THE DIRECTOR

TO

THE HON. THE SECRETARY FOR AGRICULTURE AND STOCK

(*As required by "The Sugar Experiment Stations Acts, 1900 to 1946"*).

BRISBANE:
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FORTY-SEVENTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to present the Forty-Seventh Annual Report of the Bureau of Sugar Experiment Stations, covering the period from 1st July, 1946, to 30th June, 1947. As has occurred in the last several years, submission has been delayed pending the receipt of the final sugar figures for the 1946 season. Through shipping difficulties in the transport of the raw sugar to the refineries, final returns were not available till the end of September.

E. R. BEHNE, Director.

9th October, 1947.

Director's Report.

General.

The twelve-month period ended 30th June, 1947, has been a particularly difficult and unsettled one. Although most wartime controls have been removed, supplies of most materials have become more difficult. This has been brought about to a large extent by the imposition of restrictions on imports from the dollar counties, the recurring industrial troubles in the southern States, particularly in the coal and metal industries, and the inadequate shipping facilities, whilst the labour position in respect of cane cutting has, if anything, deteriorated. Added to this the most extensive drought in the recent history of the sugar industry was experienced in the latter half of 1946 and the early part of 1947.

The 1947 season commenced when the first cane passed through the rollers at Inkerman on 11th June. Pioneer mill commenced on 18th June, Babinda on 19th, Kalamia and South Johnstone on 25th, and Tully on 26th. Thus, by the end of June, only six of the fourteen mills north of Bowen had commenced crushing. The shortage of cutters was reflected in the low weekly tonnages—indeed reports early in August revealed that the average rate of all northern mills barely reached 50 per cent. of the normal weekly value. The prospects of material improvement in this regard are not great, and although the estimated crop is a relatively small one, it is probable that several mills will not complete their crushing until well into the New Year. Unless immediate action is taken in regard to the lifting of the 1946 sugar, it is probable that in several districts the position will be aggravated by mills having to cease crushing for lack of sugar storage space. In the past few seasons, the sugar storage position has been relieved just in time on several occasions, so that to date no mill has had to suspend operations for this reason. It is to be hoped that the 1947 season will not achieve the doubtful distinction of being the first in which lack of sugar storage space interrupted the crushing.

The growing of the crop for the 1947 harvest had anything but a propitious start. The exceptionally dry weather which followed the monsoonal rains in March, 1946, continued almost throughout the year. This considerably affected the ratooning of the crops harvested in 1946 and also gave rise to poor germinations in the newly planted cane. In many instances, particularly in the southern area, crops perished from the combined effects of drought and frost with complete loss of the subsequent ratoons. The wet season set in late and again, particularly in the central district, was followed by a dry spell which further checked growth.

In the following table are shown the monthly rainfall figures for the several districts, together with the number of wet days in each instance. Two methods of recording wet days have been adopted—(1) those days when precipitations of more than 1 point were recorded, and (2) those days when more than 20 points were recorded. The former is the meteorologists' definition of a wet day, whilst the latter has been included in an attempt to determine the periods when weather conditions may have influenced operations. It is realised, of course, that the direct influence of 20 points or more, of rain will very considerably, depending, *inter alia*, on the actual time of the day that the rain falls and the general weather over the immediately preceding days.

TABLE I.—RAINFALLS IN CHIEF CENTRES OF PRODUCTION DURING PERIOD JULY, 1946, TO JUNE, 1947, INCLUSIVELY.

(Showing Rainfall (in Points), Number of Wet Days and Number of Days on which 20, or More, Points were Recorded, Monthly, for each 6-Month Period and for the Whole 12-Month Period).

Centre.	July.			August.			September.			October.			November.			December.			Period: 6 Months.			January.			February.			March.			April.			May.			June.			Period: 6 Months.			Period: 12 Months.			Average Annual Rainfalls.
	Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		Total Rain	Wet Days		
		A	B		A	B		A	B		A	B		A	B		A	B		A	B		A	B		A	B		A	B		A	B		A	B		A	B		A	B		
Mossman	101	11	2	10	5	..	24	4	..	69	7	1	178	8	2	488	15	6	870	50	11	532	18	7	1,345	22	13	1,644	21	17	341	13	5	484	16	6	482	11	7	4,828	101	55	5,698	151	66	9,276
Cairns ..	98	5	2	13	2	..	9	4	..	17	4	..	118	8	1	227	11	5	482	34	8	363	11	8	1,429	19	13	1,567	23	11	442	10	5	523	19	9	376	11	7	4,700	93	53	5,182	127	61	8,875
Babinda..	131	6	2	18	1	..	..	..	..	89	5	1	198	5	2	595	6	6	1,031	23	11	130	2	1	3,183	19	16	2,093	18	16	613	7	6	1,679	20	16	786	10	8	8,484	76	63	9,515	99	74	16,617
Innisfail..	137	7	3	29	2	..	11	2	..	37	6	..	221	7	3	486	11	5	921	35	11	81	9	2	3,294	23	17	3,244	22	13	416	9	7	1,612	27	17	871	14	9	9,518	104	65	10,439	139	76	14,378
Tully ..	118	7	2	40	4	1	35	3	..	89	6	2	139	6	3	243	6	4	664	32	12	73	5	1	4,549	23	20	2,933	19	16	771	8	8	2,302	18	5	584	8	6	11,212	81	56	11,876	113	68	18,071
Ingham ..	12	2	..	3	1	..	52	1	1	38	1	1	44	3	1	166	5	3	315	13	6	142	4	3	3,252	24	18	2,573	21	15	68	3	1	752	17	8	166	11	3	6,953	80	48	7,268	93	54	7,892
Giru ..	..	..	..	..	..	..	..	..	..	..	..	..	5	1	..	66	3	1	71	4	1	126	2	2	4,518	14	14	2,521	8	8	..	..	..	205	2	2	12	1	..	7,382	27	26	7,453	31	27	4,596
Ayr ..	..	..	..	..	..	..	..	..	..	6	1	..	28	1	1	195	5	4	229	7	5	51	2	1	6,617	17	12	1,911	13	7	..	..	..	102	7	1	16	1	..	8,697	40	21	8,926	47	26	4,154
Proserpine	24	3	..	..	..	..	9	1	..	31	3	..	79	6	1	115	7	3	258	20	4	202	4	2	4,397	23	16	1,090	19	13	121	8	3	191	13	2	103	4	1	6,104	71	37	6,362	91	41	7,151
Mackay ..	24	2	..	..	..	..	12	1	..	38	2	1	60	3	1	108	4	3	242	12	5	166	6	3	3,115	20	13	557	16	9	99	4	3	181	10	5	103	3	1	4,221	59	34	4,463	71	39	6,691
Sarina ..	30	2	1	..	..	..	73	2	1	60	4	2	66	5	1	308	6	4	537	19	9	138	6	1	3,883	20	13	803	17	10	143	5	1	277	12	5	51	3	1	5,295	63	31	5,832	82	40	6,989
Bundaberg	17	3	..	13	2	..	108	2	1	213	5	4	345	9	5	144	11	2	840	32	12	329	15	5	2,257	18	13	910	16	9	199	9	1	175	16	2	20	3	..	3,890	77	30	4,730	109	42	4,347
Childers ..	18	3	..	48	4	1	71	3	1	105	5	3	319	8	6	450	9	3	1,011	32	14	546	13	5	2,133	19	8	1,666	16	10	374	9	1	130	12	1	17	3	..	4,866	72	25	5,877	104	39	4,178
Mary-borough	9	2	..	64	3	2	76	5	1	124	6	2	147	8	2	221	6	2	641	30	9	625	17	9	1,396	20	7	939	16	6	675	10	2	194	15	3	29	3	..	3,858	81	27	4,499	111	36	4,563
Nambour	60	2	1	4	1	..	325	4	3	346	6	5	150	6	4	351	6	5	1,236	25	18	725	13	9	2,539	19	11	2,117	23	11	621	8	5	372	19	7	31	2	1	6,405	84	44	7,641	109	62	6,416
Beenleigh	21	2	..	32	1	1	333	4	3	203	3	2	77	4	2	573	6	6	1,239	20	14	1,886	10	4	1,146	17	10	1,301	14	11	663	5	4	256	10	7	30	1	1	5,282	57	37	6,521	77	51	4,749

Wet Days: Columns "A" = Total Days on which Rainfalls were recorded. Columns "B" = Total Days on which 20, or more, points of rain were recorded.

Estimate of the 1947 Crop.

The preliminary estimate of the 1947 crop, made in May, revealed that some 3,900,000 tons of cane would be harvested from 233,600 acres, with a yield of approximately 550,000 tons of 94 net titre sugar (530,000 tons of bagged sugar).

Drought conditions have again prevailed, particularly in the Mackay and southern district, and it is possible that in these areas some reduction in tonnage may result. In the Burdekin district an excellent crop is being harvested, whilst reports indicate that in several of the northern areas some increases may be expected. In general, then, it would seem that the May estimate should at least be attained. A pleasing feature of the present winter is the absence of frosts. Last year, it will be recalled, widespread heavy frosts caused considerable damage.

Arrowing has been particularly profuse this year, and this factor may militate somewhat against a reduction of tonnage in the southern district, in that many crops intended for standover will have to be harvested.

A perusal of the estimates given in Table II. will indicate that, compared with the actual tonnages crushed in the 1946 season, the estimated values for 1947 show a slight increase in the northern and Burdekin districts, a large decrease in the Mackay area, and a very large increase in the southern district. In each instance, however, the 1947 estimate is appreciably below what may be considered as the average production capacity of the districts.

TABLE II.—SUGAR CANE HARVESTED, 1946—ESTIMATED, 1947.

1946 Crop.		Mills.	Estimate 1947 Crop.
Domestic Crushing.	Actual Crushing.		
102,050	102,050	Mossman	110,000
112,960	112,960	Hambledon	115,000
136,140	136,140	Mulgrave	142,481
158,156	158,156	Babinda	222,000
119,633	119,633	Goondi	162,000
166,172	166,193	South Johnstone	191,758
108,389	108,368	Mourilyan	125,000
183,788	183,788	Tully	204,000
225,880	225,880	Victoria	195,000
238,791	238,791	Macknade	220,000
1,551,959	1,551,959	District Totals	1,687,239
84,137	84,137	Invicta	63,000
174,705	174,705	Pioneer	182,000
187,267	187,267	Kalamia	202,000
210,624	210,881	Inkerman	250,000
656,733	656,990	District Totals	697,000
98,345	98,188	Proserpine	60,000
163,775	163,807	Farleigh	120,000
179,697	179,544	Racecourse	100,000
169,870	169,940	Pleystowe	110,000
137,181	137,132	Marian	100,000
64,093	64,093	Cattle Creek	45,000
90,288	90,288	North Eton	60,000
156,782	156,782	Plane Creek	75,000
1,060,031	1,059,774	District Totals	670,000
99,316	99,316	Bingera	130,000
65,594	65,594	Fairymead	160,000
54,297	71,729	Millaquin	147,000
17,432	0	Qunaba	65,000
23,068	23,068	Gin Gin	35,000
45,949	45,949	Isis	104,580
25,540	25,597	Maryborough	46,653
10,224	10,167	Mount Bauple	35,000
89,052	89,052	Moreton	100,000
15,280	15,280	Rocky Point	12,000
445,752	445,752	District Totals	835,233
3,714,475	3,714,475	State Totals	3,889,472

1946 Crop Statistics.

The total tonnage crushed in 1946 was 3,714,475 tons of cane, and, as would be expected, short seasons were experienced by most mills. The only two mills which treated crops of normal magnitude were Victoria and Macknade in the Ingham district, where seasons of 25 and 27 weeks' duration respectively were required. Inkerman was the last mill to finish—5th December. At the other end of the scale, four mills had seasons of less than eleven weeks, and one mill (Qunaba) did not crush—all in the southern district. The shortest season, 6·3 weeks, was at Mount Bauple.

Again, there was the necessity to divert cane from one mill to another, although the quantity so directed was less than in 1945. The main reason, as previously, was associated with transport difficulties, although in at least one instance an accidental cane fire necessitated the transfer of cane to another mill. As explained in previous reports, it has thus been necessary to distinguish between actual and "domestic" crushings (see Table II.), where domestic refers to the quantity of cane harvested from land assigned to that particular mill, although a proportion may have been crushed at another mill. The actual crushing represents cane which passed through each mill's rollers irrespective of ownership.

As a result of the bad seasonal conditions, particularly in the central and southern districts, a substantial quantity of cane delivered at the mills was found to be of such poor quality that it was "condemned"—i.e., no payment was made for this cane. In most cases this ruling was applied to cane having a C.C.S. below seven.

Since much of this cane was actually crushed at the mills the question arose as to whether, for the purposes of this report, the condemned cane should or should not be included in the total quantity of cane crushed. For the calculation of yields of cane per acre it is apparent that condemned cane should be included in the total, but when sugar yields, either in the field or the mill, are considered it would not be correct to include this cane and credit it with the average sugar content of all the cane purchased by analysis. Gross tonnages were not available for all mills, but net tonnages were available and could be checked against other records. It was decided, therefore, to adopt the net tonnage of cane analysed and paid for by each mill as the official figure for that mill for all purposes. It is realised that this total also is not correct in relation to the technical performances of the factories, but there is no means whereby the proper adjustment may be made to account for such condemned cane in the figures relating to all phases of production and manufacture. The method adopted at least has the advantage of being consistent.

The yield of sugar in the 1946 season (including 51 tons for local sales) was 512,086 tons at 94 net titre. This represents a decrease of 132,575 tons from that of the 1945* season and is only 25,639 tons above the low 1943 value. The quantity of cane required to produce one ton of 94 n.t. sugar was 7·25 tons, which is 0·19 higher than that in 1945, and is the highest recorded since 7.32 in 1927. This high ratio may not be regarded as an indication of lowered manufacturing efficiency but is a direct result of the poor quality of the cane treated following the drought and frosts.

As already intimated, the southern district suffered most from the adverse weather conditions. This is clearly shown in Table III., where the distribution of production between the mills north and south of Townsville is shown.

TABLE III.—SUGAR PRODUCTION, 1942–1946 (tons 94 n.t.).

District.	1942.	1943.	1944.	1945.	1946.
	Tons.	Tons.	Tons.	Tons.	Tons.
North of Townsville	263,908	206,634	259,573	282,034	233,732
South of Townsville	341,772	279,813	383,967	362,627	278,354
Total	605,680	486,447	643,540	644,661	512,086

* In the Forty-sixth Annual Report of the Bureau of Sugar Experiment Stations, final sugar figures for five mills for the 1945 season were not available at the time of publication, and tentative values only were given. The final figures for these mills are :—Tully, 30,404 ; Invicta, 14,732 ; Pioneer, 28,448 ; Kalamia, 31,828 ; Mount Bauple, 4,813 tons of 94 n.t. sugar. The nett result of these is to increase the total production for the State by 72 tons, from 644,589 to 644,661 tons.

Due largely to the effects of the drought, the area harvested for milling was only 228,395 acres, a value 11,431 acres below that of 1945. In addition, some 11,000 acres were harvested for the supply of plants. The distribution between plant, ratoon, and standover cane of the area harvested for milling was as follows:—

District.	Plant.		Ratoons.		Standover.		Total.
	Acres.	Per Cent.	Acres.	Per Cent.	Acres.	Per Cent.	Acres.
Northern	33,522	35·7	60,261	64·2	59	0·1	93,842
Burdekin	16,842	67·0	8,266	32·9	27	0·1	25,135
Mackay	37,083	46·8	40,394	51·0	1,775	2·2	79,252
Southern	12,536	41·6	10,481	34·7	7,149	23·7	30,166
Total	99,983	43·8	119,402	52·3	9,010	3·9	228,395

The yields of cane and sugar per acre harvested for milling were 16·26 and 2·24 tons respectively, compared with 18·98 and 2·69 in 1945. Yields of cane lower than this have occurred only twice in the past twenty years, whilst the sugar per acre has been worse only once in that period. For seven consecutive years now the cane per acre has been below 20 tons and the sugar per acre below 3 tons. The average yields of cane and sugar per acre, together with the tonnages crushed, in the various districts are set out in Table IV.

TABLE IV.—TOTAL AND AVERAGE YIELDS BY DISTRICTS, 1946 (DOMESTIC CRUSHING).

District.	Tons Cane Crushed.	Tons Cane per Acre.	Tons 94 n.t. Sugar per Acre.
Mossman-Ingham	1,551,959	16·53	2·49
Lower Burdekin	656,733	26·13	3·77
Proserpine	98,345	9·73	1·25
Mackay	961,686	13·91	1·74
Bundaberg-Gin Gin	259,707	13·96	1·60
Childers-Maryborough	81,713	11·90	1·31
Nambour-Beenleigh	104,332	22·24	2·51
State Totals and Averages	3,714,475	16·26	2·24

In Table V. are listed the production data for the ten-year period 1937-1946. In every respect the values for 1946 are inferior to those of the previous years, with the exception of 1943. The recovery made in 1944 and 1945 has almost completely been lost.

TABLE V.—ACRES CULTIVATED AND HARVESTED, YIELDS OF CANE AND SUGAR, ACRE YIELDS, AND QUALITY OF CANE, 1937–1946.

Year.	Acres Cultivated. *	Acres Harvested for Milling.	Total Yields.		Yields per Acre.		Tons Cane per Ton Sugar.
			Cane.	Sugar.	Cane.	Sugar.	
			Tons.	Tons.	Tons.	Tons.	
1937	348,840	249,683	5,132,934	763,325	20·56	3·06	6·73
1938	347,199	251,064	5,342,085	778,136	21·28	3·10	6·87
1939	353,996	261,047	6,038,821	891,422	23·14	3·41	6·77
1940	350,851	265,738	5,180,756	759,446	19·50	2·86	6·82
1941	334,787	246,939	4,793,589	697,345	19·41	2·82	6·87
1942	316,798	238,213	4,350,642	605,680	18·26	2·54	7·18
1943	326,478	228,895	3,397,424	486,747	14·84	2·12	6·98
1944	317,386	222,215	4,398,190	643,540	19·79	2·90	6·83
1945	326,247	239,826	4,551,982	644,661	18·98	2·69	7·06
1946	317,766	228,395	3,714,475	512,086	16·26	2·24	7·25
True Average, 10 Years ..	334,035	243,202	4,690,090	678,239	19·28	2·79	6·91

* Data supplied by Government Statistician.

The molasses production—see Table VI.—was considerably above that of any of the last five years and, indeed, was exceeded only in 1939 and 1940, when abnormally large crops were harvested. The high yield of molasses per ton of cane resulted from the increased impurities associated with the drought-stricken and frost-damaged cane. As would be expected in a year of severe drought the proportion of the total molasses production used for stock feed increased appreciably, and the quantity thus used is the highest on record.

TABLE VI.—DETAILS OF DISPOSAL OF MOLASSES FOR THE TEN-YEAR PERIOD, 1937–1946. DATA SUPPLIED BY THE GOVERNMENT STATISTICIAN.

Method of Usage.	1937.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Distilleries	7,071,109	8,275,887	9,581,241	11,531,396	12,882,397	10,457,747	7,345,596	9,136,862	9,380,679	10,691,581
Fertilizer	3,363,624	3,293,543	4,295,289	3,334,372	1,510,650	1,857,300	2,122,220	2,745,617	3,074,755	2,899,167
Stock Feed	3,914,113	4,237,196	4,727,170	5,380,242	3,490,937	3,071,918	3,055,728	4,719,517	4,675,909	6,932,902
Mill Fuel	5,576,764	3,748,590	3,834,653	1,781,425	1,232,338	3,024,370	2,176,926	2,251,737	1,748,299	954,970
Other Purposes ..	157,496	232,049	188,889	228,450	158,821	303,240	441,522	254,358	423,085	241,045
To Waste	466,481	498,926	457,541	47,069	55,237	31,153	97,643	16,660	50,902	63,466
Total ..	20,549,587	20,286,191	23,084,783	22,302,954	19,330,380	18,745,728	15,239,635	19,124,751	19,353,629	21,783,131

Sugar Values, 1946 Season.

The Sugar Board has declared the final price for the 1946 season's sugar as follows:—

—	No. 1 Pool.			No. 2 Pool.	Total.
	Home Consumption.	Surplus.	Total.	Excess.	
Tons	439,457	69,630	509,087	2,948	512,035
Per cent.	86·3226	13·6774	100	..	..
Price	£21 18s. 0d.	£21 10s. 0d.	£21 16s. 11d.	..	£21 16s. 10d.

In addition, the values for the New South Wales production were—

—	Home Consumption.	Surplus.	Total.
Tons	23,953	15,815	39,768
Per cent.	60·2323	39·7677	100
Price	£21 18s. 0d.	£21 10s. 0d.	£21 14s. 10d.

The value of the Queensland crop in 1946 with these prices was thus approximately £12,160,000, a value which is about one million pounds below that of 1945. Macknade was the only mill to exceed its peak production.

In January, 1947, the British Ministry of Food agreed to pay an extra £4 15s. sterling per ton of sugar exported from Australia after 1st January that year. This increase brings the net export price for 1947 to an amount in excess of £25 per ton in Australian currency. Unfortunately, most of the 1946 sugar had been exported before the end of 1946, whilst the small 1947 crop will yield a relatively small export quota.

Maffra Sugar Beet Factory.

In earlier Annual Reports of the Bureau of Sugar Experiment Stations it was customary to include the production of white sugar from the beet factory at Maffra in Victoria. During the war period this production ceased for several years, but now efforts are being made to restore it to its pre-war scale. As a matter of interest, the following table shows the annual production of white sugar at this factory since 1930:—

Year.	Tons.	Year.	Tons.	Year.	Tons.
1930	3,457	1936	5,042	1942	2,754
1931	5,057	1937	4,153	1943	663
1932	5,418	1938	5,596	1944	689
1933	5,656	1939	1,478	1945	..
1934	5,253	1940	6,220	1946	..
1935	4,566	1941	3,219	1947	1,014

Review of the Industry.

After two years of peace the difficulties confronting industry have not lessened in magnitude. Indeed, in certain respects the position has deteriorated. Throughout the war period the sugar industry carried on in a considerably reduced condition, with the expectation of an effective rehabilitation period when peace returned. Unfortunately, as was the case with the first world war, the peace that has returned bears little resemblance to that which prevailed prior to the war, and in addition to the problems associated with the supply of materials and equipment there is the social problem resulting from man's changed attitude. This is reflected in the almost universal upheaval in industrial labour; and industry generally is confronted with the fact that pre-war standards of employment have been completely superseded.

Whilst the turmoil inevitably associated with such drastic changes has been general, it has had special repercussions on a seasonal industry such as the sugar industry. Canecutters are no longer in sufficient supply to maintain normal rates of crushing at the mills. At the time of writing, the industry is crushing cane at only 70-80 per cent. of its normal capacity and then only by virtue of the fact that about one-sixth of the crop is being harvested by farmers themselves. Nor does the prospect of improvement appear hopeful.

Sugar industries in other parts of the world have been faced with similar difficulties in the past and have had to apply drastic remedies. Louisiana had recourse to mechanical canecutters, whilst Hawaii was forced to harvest the crop in bulk and transfer to the miller the task of sorting out the millable cane from the associated rubbish.

In Queensland it appears that there are two possible solutions—(1) the importing of suitable labour and (2) the rapid introduction of mechanical harvesting. A step has been made in regard to the latter in that an industry committee has been formed in collaboration with the Commonwealth Department of Commerce and Agriculture. This committee has negotiated with a large agricultural implement firm for the development of a suitable cane loader.

Unfortunately, such developments are slow and at least a year must pass before any tangible result of this action is forthcoming. In the meantime, the industry is in the galling position of being tied down to a subnormal output when virtually unlimited amounts of sugar could be exported at a relatively high price. It would seem highly desirable that the former alternative be given close consideration.

At the other end of the process, the lifting of raw sugar from the mills is still causing grave concern. Shortage of ships and the difficult attitude of wharf labourers have resulted in a large portion of one season's sugar being still in storage well into the next season. Added to this is the high cost of bags resulting from the inflated price of jute and the absence of a subsidy on this commodity. The cost of handling sugar is now virtually double that when the mills supplied direct to ships. At the meeting of the shareholders of the Colonial Sugar Refining Co. in June, 1947, the chairman (Mr. E. R. Knox) indicated that at Pyrmont over a-third of a million pounds was being spent in the installation of bulk storage bins for raw sugar, and that this action would enable experience and data to be accumulated for the consideration of the more general introduction of bulk handling of this product. The handling of raw sugar in bulk has been a common practice in Hawaii, U.S.A., and Cuba for many years and its use in these countries is expanding rapidly. On present indications it appears that the Queensland industry will have little choice but to adopt this method of sugar handling in some form or other.

The promise of continued improvement in the fertilizer supply position, which resulted in the lifting of rationing control at the end of 1946, received a serious setback in June, 1947, when it became apparent that in respect of nitrogenous fertilizers the position had deteriorated almost to mid-war standards. This was due to the world shortage of fertilizer and lack of suitable transport. To distribute the small supplies of sulphate of ammonia as they become available a modified form of rationing for this substance has had to be reintroduced.

The standard of performance of factories, as judged by the coefficient of work showed an improvement of just less than one unit over that of 1945; recovery figures, however, were over 2 per cent. below. This, of course, is due to the poorer quality of the cane in 1946. The relevant figures are shown in the following table:—

——	1946.	1945.	Approximate Average 1937–1940.
Overall Recovery	82·57	84·69	87·5
Overall Recovery E.S.G.	82·24	84·39	87·1
Boiling House Efficiency	93·42	93·04	96·3
Boiling House Efficiency E.S.G.	93·05	92·71	95·9
Coefficient of Work	96·84	95·93	..
Coefficient of Work E.S.G.	91·89	90·96	..

The Report of the Royal Commission on Soldiers' Settlement on Sugar Lands which was presented in June, 1946, recommended an increase of 3 per cent. in each mill's peak in order to provide new assignments for soldier settlers. The Commission considered at length the question of farm area and the tonnage of cane to be produced therefrom in order to ensure that each settler would be able to obtain a reasonable living. Having due regard to normal district practices and land fertility, it was recommended (Table I., p. 17, Commission's Report) that assignments be granted to give the production of the tonnages set out below:—

Area.	Approximate Tonnage of Cane.	To Produce Approximate in 94 n.t. Sugar.
		Tons.
Mossman	700	100
Hambledon-Macknade inclusive	750	107
Invicta	650	92
Pioneer, Kalamia, Inkerman	750	115
Proserpine and Mackay	500	77
Bundaberg, Isis, Maryborough, and Moreton, not including Mount Bauple	500	67

Following on the Commission's Report "*The War Service (Sugar Industry) Land Settlement Act of* 1946" was assented to in December, 1946, and a committee entitled the War Service Land Selection Committee was subsequently appointed. This committee was charged with the function of advising the Minister for Public Lands and the Land Administration Board upon the suitability of lands for which assignments should be granted to ex-servicemen. The Director of the Bureau of Sugar Experiment Stations is represented on this committee by a Bureau officer. In addition, local committees have been constituted consisting of the Land Commissioners for each district, the district Adviser in Cane Culture, and the Cane Inspector of the mill to which the land in question is to be assigned.

These local committees have inspected some hundreds of proposed farm areas and have submitted reports to the classification committee.

The ex-servicemen applicants fall into three categories—

(1) Landless men;

(2) Landholders of unassigned land and holders of options to purchase unassigned land;

(3) Landholders with small assignments applying for an increase in assignment or holding options to purchase land for increased assignment.

Nearly 1,000 applications have been received and these are divided fairly evenly among the three categories. Personnel classification committees have been set up to determine the eligibility and suitability of each applicant. These committees consist of an ex-servicemen's representative and officers from the Lands Department, Department of Agriculture and Stock, and Bureau of Sugar Experiment Stations. Most of the applicants desirous of settling in the northern mill areas have already been interviewed and advised as to their eligibility or otherwise. At the moment interviewing of applicants is in progress in the Moreton and Maryborough districts.

The Land Classification Committee has now considered most of the land proposed for settlement in the northern districts, and it is expected that the necessary ballot will be conducted and the assignments granted to the successful applicants in the very near future.

The Preparatory Committee of the United Nations Conference on Trade and Employment at its first session in London, 1946, prepared a draft charter for the proposed International Trade Organisation. A number of the articles of this charter have an important bearing on the economy of the Australian Sugar Industry. The draft was further discussed at the second session of the Preparatory Committee, held at Geneva during 1947, and during the Geneva Conference the nations represented also engaged in negotiations directed towards the reduction of tariffs and the elimination of tariff preferences.

At present the value of Imperial preference on sugar is £3 15s. (sterling) per ton and in the past twenty years the Australian sugar industry has benefited by roundly twenty million pounds. The elimination of this preference would not only deal a staggering blow to the sugar industry, but would also detrimentally affect Australia's trade balance. To date, no information has been received as to the stage the discussions at Geneva have reached.

In view of the increasing costs of production and manufacture, the industry considered that the Commonweath Government should be approached with a request that the Sugar Agreement be amended to allow of an increase of one halfpenny in the retail price of sugar This halfpenny was voluntarily relinquished by the industry in the depression years of the early 1930's, and the price of sugar in Australia has remained constant ever since. The Commonwealth Government recognised the justice of the request as placed before the Prime Minister by a representative deputation led by the Queensland Premier and agreed to the restoration of the one halfpenny per pound. The necessary documents to implement this decision are now being drawn up.

WORK OF THE BUREAU.

In the course of the year several staff changes occurred. In May, Mr. A. F. Bell, who had combined the duties of Assistant Under Secretary (Technical) and Director of Sugar Experiment Stations was relieved of the latter position, and the writer was appointed in his stead. On the retirement of the then Under Secretary, Mr. R. P. M. Short, in June, Mr. Bell was elevated to that position.

Mr. A. H. Praeger, Mill Technologist, who since 1942 had been seconded to the Commonwealth Flax Production Committee, resigned from the Bureau in February to take up a permanent position with that organisation. Mr. L. R. Brain, Technology Scholarship holder, completed his course in Applied Science at the Queensland University and took up duties with the Bureau in March as Assistant to Mill Technologist. Mr. B. G. Adkins, who also graduated in Applied Science this year, was appointed to a similar position in March.

On the clerical side, Mr. S. Leddy replaced Mr. R. V. Riley, who was transferred to the Marketing Branch of the Department, and Miss J. F. Jones was appointed typist. Typists were appointed to the three field stations—Miss C. Barton at Meringa, Miss C. Dodgson at Mackay, and Miss P. Holden at Bundaberg.

An attempt was made to revive the research programme of the Mill Technology Division during the 1946 crushing and maceration was investigated at the Mulgrave mill. It was apparent, however, that such revival was premature and further research must be postponed till the new members of the staff have had some experience.

On the other hand, the field staff was able to undertake a very heavy programme of work.

Of considerable importance was the recommendation of the Advisory Board that a field station be established in the Lower Burdekin district. After a search of two years a suitable site was located and negotiations are now in train for the acquiring of this property.

Though still handicapped by the shortage of chemical staff, the Soils Technology section continued its fertility survey and advisory work. Survey work was carried out in Silkwood, Airdmillan, Homebush, Oakwood-Gooburrum, and North Maroochy areas, whilst a simliar survey was made by the Tully mill in collaboration with the Bureau. With the exception of that of the Airdmillan district, all surveys revealed that in respect of potash and phosphorus the standard of fertility was low. This doubtless is the result of fertilizer shortages over the war period, and some time must elapse before the reserves of plant food may be restored to a satisfactory level.

Several minor element trials revealed negative results, indicating that with respect to the elements tried (copper, zinc, manganese, and boron) the soils were adequately supplied.

The soil conservation trial in the Childers district received a severe test as the result of exceptionally heavy storm rains. Whilst gully erosion was prevented, sheet erosion took place to a considerable extent, and it would seem that the only hope of protection lies in the use of cover crops combined with late cane planting. Experiments to this end have been initiated.

The usual crossing work was carried out at Meringa and seedlings were germinated and planted out at the three stations and also at Bartle Frere in the Babinda district, where a seedling selection plot has been established in the heavy rainfall belt. When the new station at Ayr comes into operation, it will then be possible to obtain selections under still more widely differing climatic conditions.

In regard to the varietal composition of the crop, the challenge referred to in the last Annual Report of the Bureau was successful, in that the varieties Q.28 and Trojan displaced P.O.J.2878 and Co.290 for second and third places respectively. This was due partly to the phenomenal increases in the two former varieties and partly to the failure of the crop in the south. Indeed, as the result of the increase of C.P.29/116 at the expense of Co.290, the latter variety was relegated to sixth place, E.K.28 occupying fifth place with about the same percentage as in the 1945 crop. As the result of these changes Queensland-bred varieties provided 42·5 per cent. of the crop—an increase of 7·4 per cent. over the value for the 1945 crop. Since 1941 Queensland has headed the list in so far as country of origin of varieties is concerned, and it is probable that within the next two seasons more than half the crop will result from canes bred in this State.

The disease position in general has remained at a satisfactory level. An extension of the quarantine area in the Mossman district was necessary to cope with an expansion of the area affected by gumming following the outbreak there in the previous year. Leaf scald in Q.44 and Trojan in the northern area is causing a little concern in view of the increasing popularity of these varieties—particularly the former. Fiji disease in the southern district is still an important factor and in certain portions of the Bundaberg area some increase has been noted.

For the hot-water treatment of setts to control chlorotic streak a mobile hot-water tank has been on trial with satisfactory results.

The failure of Q.28 to ratoon successfully in certain parts of the Mackay area has caused considerable concern and the pathologists have initiated experiments in an attempt to determine the reason for this.

The use of mercurial fungicides to improve the germination of setts has been tested on a fairly wide scale and results indicate the advantages of this treatment when planting is carried out under adverse weather conditions.

Due to its marked susceptibility to red rot, the distribution of the promising variety Q.52 in the southern district has been suspended pending further observation.

The extended drought had the effect of reducing considerably the loss due to grubs. At the same time, it interfered with the trials set out to investigate the use of the new insecticide "Gammexane" as a control measure for this pest, with the result that much of this work has to be repeated. The promise of this chemical is so great, however, that Cane Pest and Disease Control Boards have ordered large quantities (totalling nearly 200 tons) for use in the coming season. Tentative instructions for its use, based on results to date, have been issued by the Bureau. In the control of wireworms, "Gammexane" has also given promise and further trials are being set out for this purpose.

As the result of amending legislation, provision has now been made under the Sugar Experiment Stations Acts for Cane Pest and Disease Control Boards to subsidise growers in regard to materials and services for the control of pests. Also, on the recommendation of the Advisory Board, a comprehensive set of "Powers and Duties" was drawn up and issued to all Boards.

Two Pest Board Conferences were held during the year, one in August at Tully, and one in May at Innisfail.

Station Field Days were also revived. One was held at Mackay on 18th June and another at Meringa on 20th June. The condition of the Bundaberg Station as the result of drought and frost did not warrant the holding of a function there. Both days were very successful and there were excellent attendances. The procedure was modified in that the visitors were conducted round the station in small groups instead of in a body as was done on past occasions.

The problem of obtaining satisfactory green manure crops in the northern areas, where wilt and bean fly greatly reduce the efficacy of the ordinary varieties of legumes, has long been appreciated, and many new varieties and strains have been tested. At present there appear to be several which offer distinct promise and a supply of seed is being built up for wider application.

The new hormone-type weedicides, "Methoxone" and "2:4 Di-weed" (also referred to as 2, 4-D) were investigated experimentally in all areas on a wide variety of farm weeds. Sufficient information is already available from this initial work to list several pest plants as susceptible or resistant, while further work is necessary to define the reaction of those plants with some degree of tolerance. The possibility of controlling nut grass with these chemicals is perhaps the most interesting and valuable phase of this work.

Again the Mutual Control was operated in full, but the issue of the Annual Synopsis has been delayed by the printer. The Quarterly Bulletin has been issued regularly whilst several News Letters have been brought out.

The levy for the 1946 season was one penny per ton of cane. Receipts and disbursements for the year in question and totals since the inception of the Sugar Fund in 1900 are shown in Appendix I, whilst for the benefit of readers outside the Queensland Sugar Industry the derivation of the C.C.S. formula is given in Appendix II.

Appendix I.

"*The Sugar Experiment Stations Acts*, 1900 *to* 1946."

SUGAR FUND.

Statement of Receipts and Disbursements from 1st July, 1946, to 30th June, 1947.

Receipts.	£	s.	d.	Disbursements.	£	s.	d.
To Balance	28,464	9	4	By Salaries	15,951	12	3
,, Assessments	15,484	14	1	,, Contingencies	7,715	7	4
,, Endowment	7,000	0	0	,, Bundaberg Contingencies	2,167	11	8
,, Bundaberg	716	6	8	,, Mackay Contingencies	2,435	17	10
,, Mackay	1,434	17	11	,, Meringa Contingencies	2,480	14	8
,, Meringa	502	3	2	,, Balance	23,141	9	1
,, Sundries	290	1	8				
	£53,892	12	10		£53,892	12	10

Statement of Receipts and Disbursements from Inception of Fund, 1st December, 1900, to 30th June, 1947.

Receipts.	£	s.	d.	Disbursements.	£	s.	d.
To Assessments	355,149	3	0	By Disbursements	660,936	17	11
,, Endowment	253,862	3	0	,, Balance	23,141	9	1
,, Sugar Experiment Stations ..	75,067	1	0				
	£684,078	7	0		£684,078	7	0

Appendix II.

C.C.S. FORMULA.

$$\text{C.C.S. in cane} = \text{Pol in cane} - \frac{\text{Soluble impurities in cane}}{2}$$

In practice, per cent. C.C.S. is calulcated by the empirical formula—

$$\text{C.C.S.} = \frac{3P}{2}\left(1 - \frac{5+F}{100}\right) - \frac{B}{2}\left(1 - \frac{3+F}{100}\right)$$

where—

P = pol in first expressed juice.
B = brix in first expressed juice.
F = fibre in cane.

Division of Soils and Agriculture.

SOIL TECHNOLOGY.

(By L. G. Vallance, Chemist.)

Laboratory Work.

The following is a summary of the analytical work performed at the Brisbane Laboratory for the period 1st July, 1946, to 30th June, 1947:—

Soils.	No. of Samples.
Soil fertility surveys	237
Farmers' samples	149
Experimental plots—	
(*a*) Fertility trials	59
(*b*) Lime trials (pH only)	646
Miscellaneous.	
Water samples—	
(*a*) Irrigation survey	44
(*b*) Farmers' samples	43
Lime samples	8
Mill by-products	9
Total	1,195

Fertility Surveys.

The soil fertility survey work was continued and farms in the following districts were surveyed:—Silkwood, Airdmillan, Homebush, Oakwood-Gooburrum, and North Maroochy. With the exception of the lastnamed area, the analyses of which will be completed shortly, all growers from whose properties the soil samples were taken have been advised of the results of the analyses, together with the requisite fertilizer and liming recommendations. In addition, 110 similar recommendations were forwarded to the Tully area as the result of the soil analytical work carried out in the Tully mill laboratory. The enterprise of the Tully Co-operative Sugar Milling Association Ltd., in carrying out a fertility survey, will undoubtedly assist mill suppliers in that district to maintain an efficient fertilizer programme.

The Airdmillan area, in common with the rest of the Lower Burdekin, had received practically no potash fertilizer during the six years of fertilizer rationing. It was felt, therefore, that the soil reserves may have become depleted in this essential element. However, it is pleasing to note that the figures obtained during the recent survey indicated that these lands still contained excellent amounts of available potash. Tables 1 and 2 show the distribution of available phosphate and potash in each of the areas surveyed. The fertility of the soils from the Lower Burdekin is outstanding in both cases.

Table I.—Available Phosphate.

Showing the percentage of soil samples at each fertility level.

District.	Very Low.	Low.	Fair.	Good.	Very Good.	No. of Samples.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Homebush	4	34	47	15	0	80
Silkwood	0	44	28	28	0	18
Oakwood	2	21	34	25	18	71
Airdmillan	0	0	0	0	100	68
Tully	2	36	26	30	6	100

Table II.—Available Potash.

Showing the percentage of soil samples at each fertility level.

District.	Very Low.	Low.	Fair.	Good.	Very Good.	No. of Samples.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Homebush	5	21	69	5	0	80
Silkwood	6	22	44	28	0	18
Oakwood	52	9	21	17	1	71
Airdmillan	0	0	3	16	81	68
Tully	1	52	24	23	0	110

Fertilizer Experiments.

After a lapse of five years it was again possible to present the results of a series of fertilizer trials as an advisory article in the Cane Growers' Quarterly Bulletin. The harvest figures of four lime trials which had been set out on acid soils in the Northern and Central districts indicated that the application of agricultural lime had produced a beneficial effect on these soils. These trials will now be ratooned in order to estimate the effect of the lime on the ratoon crops.

A fertilizer trial harvested at South Kalkie, Bundaberg, showed the necessity for moderate applications of potash and somewhat larger amounts of superphosphate. In previous years this soil type had shown practically no response to potash and the substantial gain which occurred with the application of a potash fertilizer indicated the extent to which the soil reserves had become depleted during the war-time shortage of this essential plant food.

In the Mackay district a fertilizer trial which was laid down on a plant crop at Walkerston showed a considerable increase in yield due to the application of sulphate of ammonia. Superphosphate and potash dressings had a beneficial effect on the C.C.S. content of the cane.

Three minor element trials were harvested in which the possible responses to small applications of copper, zinc, manganese, and boron were being investigated. One of these had been set out on the Mackay Experiment Station, while another was laid down on the red volcanic soil of the Experiment Station at Bundaberg. The third trial was located at South Kalkie, Bundaberg, on a forest soil which may be described as a reddish brown sandy loam. It was found that none of these treatments had any effect on either the yield or sugar content of the cane. It would, therefore, appear that even after years of cultivation these particular soils still contain a sufficiency of the elements in question.

Because of the tendency of potash to hasten maturity, and thus increase the sugar content of cane cut early in the season, potash trials have been set out on each of the three Experiment Stations. These have been designed to determine whether potash is more effective in influencing the C.C.S. when applied as a top dressing rather than at planting.

Soil Erosion Control.

Because of monsoonal rains of almost unprecedented intensity in that district, the soil erosion control experiment at Childers was subjected to a thorough test under very severe conditions. At the time the trial area was under plant cane approximately six feet high. A considerable amount of soil movement occurred and the terrace ditches became almost completely silted up. However, the system of terraces, assisted by the covering crop of cane prevented the formation of deep gullying, which was so noticeable in other fields following the rains, but it did not prevent an appreciable movement of soil by sheet erosion.

It is evident that, in addition to contour planting, some method of covering the soil with a growing crop must be established if the loss of soil from fallow land which has been prepared for planting is to be avoided during the wet season. This may necessitate some change in the usual farm schedule for this district. Accordingly, therefore, a varietal trial was planted out in April in order to ascertain the suitability of several cane varieties for late planting. If any particular cane demonstrates that it is capable of successful growth in the district when planted about two months later than the usual planting period, then it may be possible to maintain a protective cover on the field by the growth of a suitable legume, such as Poona pea, throughout the period of summer rains. This erosion control experiment has provided a considerable amount of valuable information, and the knowledge gained is undoubtedly a step forward in providing some practical means of control.

Publications.

The following article was published during the year—"A Further Review and Comparison of Fertilizer Trials in North Queensland during 1932-36 and 1937-41," by L. G. Vallance, Proceedings of the Queensland Society of Sugar Cane Technologists, 1947.

NORTHERN SUGAR EXPERIMENT STATION, MERINGA.

(Mr. J. H. Buzacott, Entomologist, Officer in Charge.)

Meteorological and Crop Growth Reports.

The second half of the year 1946 was notable for its sparse rainfall, and for the period July to December only 317 points of rain were registered. These dry conditions were not relieved in January, during which month one and a-half inches of rain were recorded, but in the second week in February heavy rains began and continued for eight days. At the conclusion of this, however, no further good falls were measured during the first half of 1947, although showers during April and May provided some surface moisture for early planting. The total rainfall for the twelve months from 1st July, 1946, to 30th June, 1947, yielded only 35·24 inches, which is just a little over one-third of the average annual rainfall at Meringa.

The droughty period during the second half of 1946 resulted in tremendous grub damage throughout the greater part of the southern end of the Mulgrave area. Fortunately the same droughty conditions were so prolonged that a very considerable reduction in beetle flights resulted. This was followed by a consequent falling-off in grub populations in the 1947 crop, although towards June, 1947, a fair amount of grub damage commenced to show up in the drought-affected cane.

During late 1946 and early 1947, prior to beetle flight, those blocks most susceptible to grub attack on the Experiment Station were treated with "Gammexane." Following the beetle flight, diggings indicated that there were insufficient grubs in any block to warrant fumigation, although some stools were found with low grub populations. However, even had fumigation been necessary it would have been difficult because, owing to the delayed beetle flight, cool conditions set in before grubs were sufficiently close to the stool for efficient fumigation. Dry weather was experienced so early, however, and the soil dried out so rapidly that most blocks on the station, other than those treated with "Gammexane," showed slight to moderate grub damage. This was made evident in the case of heavy crops by the uprooting of the stools, and in the case of lighter crops by a yellowing of the cane crops.

Due to the dry spring and summer period it was not practicable to plant green manure crops until early in December, and the small amount of rain which then fell was followed by a further two months of dry weather, so that the legume crops were generally a failure. Those which survived the drought mostly succumbed to wilt when good growing conditions finally eventuated. For two years in succession the green manure crops have been almost a failure and the advent of new varieties of legumes which are resistant to wilt is eagerly awaited by farmers.

In the following tables are shown the rainfall records taken at the Northern Sugar Experiment Station over the last 22 years together with an abstract of other meteorological observations:—

Table I.—Abstract of Meteorological Observations made at Northern Sugar Experiment Station, from 1st July, 1946, to 30th June, 1947.

Month.	Rainfall (Inches).	Number of Wet Days.	Shade Temperatures.						Mean Diurnal Range.	Mean Temperature 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum.			Minimum.					
			High.	Low.	Mean.	High.	Low.	Mean.			
1946.											
July	0·53	7	86·5	75·0	80·82	67·0	43·5	55·43	25·39	69·46	84·0
August	0·05	6	90·2	80·0	84·14	63·0	40·8	54·89	29·25	71·68	67·0
September	0·04	4	96·0	82·5	87·29	66·5	50·0	58·79	28·50	76·06	64·0
October	0·27	6	94·5	85·0	89·7	69·5	51·0	61·72	27·98	80·35	59·0
November	0·32	7	96·5	84·0	92·38	73·5	58·2	67·78	24·60	85·55	65·0
December	1·96	14	97·0	86·5	93·0	75·2	64·2	70·95	22·05	86·35	72·0
1947.											
January	1·52	9	102·5	87·0	96·13	80·7	69·5	73·69	22·44	88·83	68·0
February	13·79	21	97·6	84·5	91·3	77·8	69·2	73·5	17·80	85·00	79·0
March	9·35	24	96·0	82·0	89·16	76·5	68·0	72·47	16·69	84·46	87·0
April	2·30	13	93·0	82·0	87·54	73·5	55·5	65·2	22·34	79·37	77·0
May	3·17	24	86·5	76·0	82·95	69·0	59·5	65·5	17·45	77·25	83·0
June	1·94	13	87·0	75·5	83·92	69·0	53·6	62·28	21·64	73·27	85·0
Totals	35·24	148	..	..	..	..	..	..	..	..	..

RAINFALL RECORDS, 1925-1947.

Year.	Rainfall Inches.	Years.	Rainfall Inches.
1925	76·98	1937	46·33
1926	59·12	1938	55·86
1927	90·16	1939	118·08
1928	66·33	1940	84·58
1929	102·28	1941	84·65
1930	107·61	1942	60·14
1931	98·82	1943	47·31
1932	76·31	1944	60·73
1933	96·06	1945	117·60
1934	91·44	1946	55·18
1935	59·91	1947 (6 months)	32·07
1936	88·81	**Average for 22 years**	**79.28**

Work of the Station.

Experiments Harvested During the 1946 *Season.*—Three seedling trials were harvested during the year, and these were made up of a first ratoon trial in the form of a 5 x 5 Latin Square, a first ratoon yield-observation trial, and a plant yield-observation trial. The latter experiment contained 19 "E" seedlings, one "D" seedling, and the standard variety Q.13. The presence of high grub infestation in this block, and the fact that two attempts to fumigate were defeated by the dry weather, resulted in considerable grub damage. It was therefore difficult to assess the relative value of varieties, but the best appeared to be E.275. No final decision will be made on these seedlings until the ratoon crop is harvested.

The ratoon yield-observation trial included 20 "D" seedlings with Q.13 as standard of comparison. A fair ratoon crop was obtained despite the dry weather and the most promising canes, D.216, D.221, D.225, D.233, D.271, and D.287, were planted out in a replicated trial. They have also been planted in farm propagation plots throughout the northern areas for observation under a wide range of climatic and soil conditions.

The ratoon Latin Square trial in which the varieties Trojan, P.O.J.2878, Q.13, Q.44, and the seedling B.232 were being compared, was harvested in September, 1946, at the age of 10½ months. C.C.S. figures were not so high as in the plant crop, but ranged from 16·76 in B.232 to 18·90 in Trojan. Analysis of the trial indicated that in tons of sugar per acre at the 1 per cent. level of significance Trojan exceeded all other varieties and Q.44 and B.232 exceeded P.O.J.2878 and Q.13. These results closely follow those of the plant crop. B.232 was lowest in sugar content on each occasion and despite its superiority in yield over Q.13 and P.O.J.2878 the lower sugar content may limit its general usefulness.

In the original seedlings normal selection was carried out on the ratoons and in addition a rapid selection of the plant blocks was made. The plant seedling blocks were badly grub-damaged early in 1946 and subsequent to the selection the major portion of the area had to be ploughed out. The selection of both plant and ratoon seedlings resulted in more 40-sett plots than usual being planted out.

The annual cross pollination programme involved station staff in a considerable amount of work the details of which are covered in the "Report of the Committee on Seedling Propagation" printed elsewhere in the Annual Report. The "Report of the Division of Entomology and Pathology" includes the experimental work on pest and disease control carried out at this station during the year.

For the first time since 1941 a Field Day was held at Meringa on 20th June, 1947. The suitable planting weather at that time unfortunately militated against a large attendance of local growers, but this was made up by a good gathering from more distant mill areas. The day, which was devoted to addresses and inspections of all experimental work being performed, proved highly successful.

Legume Trials.—Small parcels of a large number of new legumes, principally cowpea crosses, were received for trial and were planted in duplicate plantings on red and grey soil during early December. In addition, Cristaudo pea, *Crotalaria sericea, Phaseolus ricciardianus,* and Reeve's selection were planted out from seed grown on the station. Very few of the cowpea varieties produced better growth than Poona pea, whilst a number of them, including Poona, succumbed to wilt after the heavy wet weather in February. A few of the varieties were deemed worthy of further trial and seed of these was harvested. The best performance was registered by Reeve's Selection Q.1582, (New Era x Poona) x Mammoth 4312, (New Era x Poona) x Mammoth Q.1568, Large White x (Snake x Poona) 4307, and Cristaudo pea. All were wilt resistant except Large White x (Snake x Poona) 4307, which proved somewhat susceptible though vigorous.

The following comments are offered on a few legumes which have now been grown in several trials:—

Reeve's Selection Q.1582.—This variety has shown great promise owing to high wilt resistance and somewhat longer growing period than Poona pea. A small amount of seed has been sent to the Tableland for propagation and stocks are now being built up.

Cristaudo Pea.—A very promising legume sometimes referred to as Ingham pea. It has performed well under both very wet and very dry growing conditions. The variety is resistant to wilt and is a reliable, though not a very heavy cropper. The growing period is about five months. Cristaudo pea is now being produced on the Tableland in small quantities and it is anticipated that its use will spread rapidly as soon as commercial quantities are readily available.

Crotalaria sericea.—Further trials with this member of the rattlepod family have shown that it will probably not be of much use as a green manure crop under northern conditions. Germination is unreliable and the early development so slow that a thick growth of weeds is liable to smother the legume before it becomes established.

Weedicides.—Trials with two hormone type weedicides—viz., "Methoxone" and 2, 4-D—were carried out on various weed and grass species. These non-poisonous agents proved effective against some weeds of sugar-cane lands, but their value in cultivation is limited by the fact that grasses are practically unaffected by weedicides of this type and many of the major weed pests in sugar-cane cultivation are grasses. In order to assist in identification of weeds during these trials an herbarium collection was made comprising to date 72 named specimens.

Laboratory Work.

The following is a summary of the analyses carried out during the year:—

Cane (maturity tests and Experiment Station samples)	409
Cane (farm trials)	57
Cane (growers' samples)	11
Soil (lime tests)	14
Soil (moisture determinations)	18

Crop Summary.

Cane sent to mill	278·6 tons
Cane used for plants, samples, &c.	28·8 tons
	307·4 tons
Total area harvested	16·76 acres
Tons per acre harvested	18·3
Class of cane—	Per cent.
Plant cane	48
Ratoon cane	52

CENTRAL SUGAR EXPERIMENT STATION, MACKAY.

(Mr. C. G. Story, Adviser, Officer in Charge.)

Meteorological and Crop Growth Reports.

The absence of winter rainfall in the Mackay area was a bad start to the 1946-47 year. The position was aggravated by unusually severe frosts and the 1946 crop, which had promised well, deteriorated due to late drought and frost. Early spring planting rains did not materialise although light localised showers were experienced in various parts of the area. Spring planting was consequently performed under the handicap of low soil moisture and poor planting material. From 1st July until late December only 1·40 inches of rain were registered, this being one of the driest periods on record. The young plant cane held on remarkably well, but ratoon prospects were poor as considerable acreages of ratoon cane had failed through death of the stools.

At the end of December a fall of 1·68 inches gave temporary relief, but as January rainfall was only an inch and a-quarter the crops made little progress. Very heavy and continuous rains in the first half of February revived the crops, which made rapid progress, but they were still very backward for this period of the year and the stooling of plant cane was poor. Good March rains maintained further crop development, but the next three months were again very dry and hopes of even average crops soon disappeared. The crop prospects for 1947 crushing are well below normal, principally due to the short growing period and the lateness of the wet season rains.

Q.28 once more demonstrated its value to the Mackay district and there is little doubt that, with only the older varieties, the crop position would be even more serious after such an abnormal year. The effect of the drought and frost on the 1946 crop was exemplified by the progressively larger amount of dead cane found in blocks as the season advanced.

The success of irrigation in the Mackay district as practised by a few growers was made even more spectacular by the drought conditions and considerable interest was aroused in this farm practice. Only shortage of material has prevented the installation of many more irrigation plants.

The following meteorological observations were made at the Station during the year. The rainfall records (also given below) prior to 1935 were made at the old Sugar Experiment Station, Lagoons, but since that date have been taken at the site of the present Station at Te Kowai.

Abstract of Meteorological Observations Made at the Central Sugar Experiment Station, Mackay, during Period 1st July, 1946, to 30th June, 1947.

Month.	Rainfall (Inches).	Wet Days.	Average Rainfall (Inches).	Shade Temperature.					
				Maximum.			Minimum.		
				High.	Low.	Mean.	High.	Low.	Mean.
1946.									
July	0·37	2	1·37	83·0	67·5	75·4	60·0	35·0	44·5
August	..	..	0·98	82·0	73·5	77·7	57·0	39·5	48·0
September	0·05	1	1·59	92·0	75·0	80·4	66·5	44·5	51·6
October	0·51	2	1·78	87·5	76·0	82·5	70·0	47·5	59·0
November	0·47	3	3·00	96·0	84·0	88·2	75·0	57·5	66·2
December	2·44	8	6·75	94·0	84·0	88·95	76·5	62·5	70·4
1947.									
January	1·29	6	13·44	98·0	85·0	90·4	80·5	66·5	73·2
February	33·68	19	12·27	93·0	75·0	82·5	75·5	65·5	71·5
March	7·03	17	10·85	89·0	77·0	84·45	75·8	65·5	70·5
April	0·37	3	5·25	86·5	79·0	81·6	74·5	52·0	61·5
May	1·13	13	3·10	80·5	69·0	73·8	71·0	52·0	61·7
June	0·75	4	2·53	81·5	71·0	75·3	64·0	38·5	50·8
Totals and Averages ..	48·09	78	62·89	..	..	..	..	..	..

ANNUAL RAINFALL SINCE 1920 AT THE SUGAR EXPERIMENT STATION, MACKAY.

Year.	Rainfall Inches.	Year.	Rainfall Inches.
1920	57·27	1935	45·15
1921	95·89	1936	97·37
1922	34·47	1937	56·60
1923	25·23	1938	52·18
1924	53·37	1939	56·14
1925	54·80	1940	84·97
1926	34·60	1941	71·38
1927	83·87	1942	77·92
1928	72·28	1943	60·11
1929	64·03	1944	53·16
1930	55·81	1945	46·76
1931	30·01	1946	53·74
1932	48·48	1947 (6 months)	44·25
1933	71·94	**Average for 27 years**	**58.34**
1934	37·57		

Work on the Station.

Experiments harvested during the 1946 Season.—Three varietal trials were harvested during the 1946 season, being a first ratoon 5 x 5 Latin Square type trial including four "B" seedlings with Q.28, a plant yield-observation trial with "E" seedlings, Q.47 and Q.28, and a ratoon yield-observation trial with "D" seedlings, Eros, and Q.28.

In the Latin Square trial B.160, B.172, and B.175 were not so attractive as B.174 and Q.28 even as early as March, 1946, and when selections were eventually made B.174 was the only cane considered worthy of further planting. This variety produced a heavy ratoon stool, withstood dry weather fairly well, and aggregated 6·37 tons of sugar per acre for the two crops as compared with 6·60 tons of sugar per acre for Q.28. Analyses of the ratoon yields showed no significant differences in tons of cane or of sugar per acre.

The ratoon yield-observation trial included eight "D" seedlings with Eros and Q.28. At the time of harvest there was a considerable amount of dead cane in the seedling plots as a result of the drought conditions; in particular D.113 and D.115 had suffered so badly that the cane was not sent to the mill. The Q.28 plots were, in general, much more impressive than the seedlings. None of these "D" canes was considered worthy of further trial and all have been discarded.

The plant yield-observation trial was designed to test the performance of nineteen "E" seedlings and Q.47 against Q.28. At harvest time a fair amount of dead cane and red rot was obvious, E.117, E.118, and E.126 being so badly affected that satisfactory samples for analysis could not be taken. Q.47 withstood the dry weather better than any other cane in the trial. Final selections will not be made until the results of the ratoon crop are known.

A minor element trial was also harvested during the period of this report. In this Latin Square type trial an attempt was made to measure the effect, if any, of dressings of the elements boron, manganese, copper, and zinc in addition to normal fertilizer applications. No significant responses were obtained from copper sulphate, zinc sulphate, and borax at the rate of 25 lb. per acre, nor from manganese sulphate at 15 lb. per acre. The treatments have been repeated on the ratoons.

Legumes.—Small quantities of 38 cowpea varieties were planted as a bean-fly resistance trial. These were spray irrigated for germination and early growth was good. Bean-fly accounted for a number of plants throughout the plot area, and the heavy rains in February resulted in considerable losses from wilt. Progressive observations were made and eventually seed was collected from seven of the most promising strains. These were Victor x (Large White x Skewbald) 4327, Large White x (Snake x Poona) 4308, (New Era x Poona) x Mammoth Q.1568, Large White x Skewbald Q.1565, Reeve's Selection Q.1582 (New Era x Poona) x Mammoth 4312, and Poona x Victor 4313.

Seed was also collected from the rice bean (*Phaseslus ricciardianus*) for further trial.

Ramie.—A trial planting of this fibre plant was made to test its suitability for Mackay conditions. It did not make promising growth despite irrigation and adequate fertilization and the yield was poor. The crop is being continued for further observation.

Experiments Initiated during the Year.—A filter mud trial was planted involving varying mud applications with and without fertilizers. A fertilizer placement trial was laid down to measure the relative effects of surface and sub-surface placement of fertilizer at planting time. A cultivation trial was inaugurated on a ratoon cane crop to compare the benefits of bumper-discing combined with (*a*) grubber and scarifier and (*b*) cotton king and scarifier as against no bumper-discing but only the (*a*) and (*b*) treatments. The usual seedling trials were also planted, including a Latin Square layout with Q.50, Q.28, B.174, Trojan, and P.O.J.2878.

Laboratory Work.

The following is a summary of the cane samples submitted to the laboratory for testing:—

Station samples	258
Trial samples for maturity tests	57
Farmers' samples for maturity tests	98
Show canes	26
Total	439

Summary of Crops Harvested on Station.

Total cane harvested	782·5 tons
Total area harvested	33·5 acres
Average tons per acre	23·4 tons
Class of cane—	
Plant	577·7 tons
Average per acre	25·3 tons
Ratoon	204·8 tons
Average per acre	19·1 tons

SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG.

(Mr. N. J. King, Senior Adviser, Officer in Charge.)

Meteorological and Crop Growth Reports.

The winter of 1946—as reported in the previous annual report—was an excessively cold one. Following on the seventeen frosts in June there were ten recorded frosts at the Station in July and one in August. Even at the end of the latter month, screen minima of 40 deg. were still being occasionally registered. Practically all cane crops on dry farms were killed by these low temperatures and much bigger cane on irrigated properties was also dead or side shooting. No abatement of the drought conditions developed. July and August rainfall totalled 26 points and a fall of 111 points in September gave no relief to standing crops. It was of some little value, however, to spring-planted cane, ensuring fair germinations, and 211 points in late October relieved the position for later plantings. November was the first real sign of storm rains developing, but the 318 points recorded were not followed by the usual December conditions, when only 104 points were recorded on eight wet days. Ratoon crops indicated that subsoil moisture was lacking and relief was not obtained until late January. February saw a definite change for the better; nearly 20 inches were recorded, and this was followed by 10 inches in early March. These rains saturated the whole countryside and caused two floods in the local rivers. The following three months saw a reversal to semi-drought conditions again, the rainfall for April, May, and June totalling only 226 points.

In June, 1947, cold and frosty conditions set in. Ten frosts were recorded, some of them fairly severe, but they were unable to do the harm experienced in 1946 owing to the more forward nature of the crops. Young autumn plant crops were burnt off in many areas by these frosts, but the damage to harvestable cane was restricted to Wallaville, Maroondan, Pine Creek and South Bingera.

During the flood periods referred to above the Kolan River rose to record heights and submerged Avondale Plantation and the majority of the Tegege river flat land. Damage was variable—as it always is with floods—some crops being killed by silt in the hearts and others unaffected where water was flowing. Considerable erosion occurred on Avondale Plantation and much deposition of sand occurred there and on other properties. The smaller flood on the Burnett did little damage and this was restricted to a few farms at Oakwood.

Crops.—Growth after the heavy rains of February-March was phenomenal. There is little doubt that droughts are not all bad in their effects. The spell given to the land, the lack of leaching and diminution in plant uptake of nutrients, and the accumulation of nitrates during a long dry spell was very evident when rain did fall. This year's crop was virtually grown—on the dry farmed area—from February to early April and crops are not far short of the peak tonnages. When considered in conjunction with the fact that there was practically no standover cane from 1946, the performance is notable.

The relatively light crop in the Isis district suggests lesser recuperative powers following the disastrous 1946 drought. This is probably associated with the tendency of the Isis to be a one-variety district. The major variety, P.O.J.2878, was the worst affected by the drought and frost, hence the other areas, by virtue of their relatively high percentage of C.P.29/116 and Co.290, have made a far better recovery. During the year under review most of the southern mill areas planted large acreages of C.P.29/116 and Q.49, these varieties displacing Co.290 and P.O.J.2878 respectively. The latter is on the down grade in popularity because of the higher disease resistance and better vigour in the newer canes.

The following are the rainfall records taken at this Station since it began operations in 1914. To conform with the year covered by this report, the rainfalls are given for the growing season beginning in July and ending in June; an abstract of the meteorological observations made at the Station during the year is also appended.

RAINFALL RECORDS, 1914–1947

Year.	Rainfall Inches.	Year.	Rainfall Inches.
1914–15	31·99	1931–32	22·88
1915–16	28·54	1932–33	36·81
1916–17	58·08	1933–34	71·45
1917–18	49·85	1934–35	40·01
1918–19	24·24	1935–36	44·24
1919–20	28·20	1936–37	31·65
1920–21	45·16	1937–38	44·40
1921–22	44·97	1938–39	41·01
1922–23	37·14	1939–40	41·69
1923–24	34·16	1940–41	43·26
24–25	50·96	1941–42	33·52
25–26	37·62	1942–43	40·75
1926–27	68·18	1943–44	45·22
1927–28	74·69	1944–45	28·14
1928–29	31·16	1945–46	26·10
1929–30	43·16	1946–47	44·52
1930–31	47·19	**Average for 33 years**	**41.54**

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG, FROM 1ST JULY, 1946, TO 30TH JUNE, 1947.

Month.	Rainfall (Inches).	Wet Days.	Shade Temperatures.						Mean Diurnal Range.
			Maximum.			Minimum.			
			High.	Low.	Mean.	High.	Low.	Mean.	
1946.									
July	0·17	2	78	60	72·03	57	31	42·96	29·07
August	0·09	1	80	71	75·44	60	37	47·03	28·41
September	1·11	2	85	74	76·88	65	40	52·44	24·44
October	2·11	5	84	74	78·36	69	49	58·6	19·76
November	3·18	7	94	79	84·38	74	61	67·07	17·31
December	1·04	8	91	84	86·66	76	65	71·0	15·66
1947.									
January	3·91	11	92	78	86·52	77	64	70·95	15·57
February	19·62	15	84	76	81·77	75	64	69·21	12·56
March	10·03	11	88	79	82·82	74	60	64·65	18·17
April	1·43	5	86	76	80·0	72	52	59·95	20·05
May	1·65	10	79	70	75·33	70	43	58·92	16·41
June	0·18	1	76	68	73·0	58	34	43·04	29·96
Totals	44·52	78	..	..	..	..	..	..	..

Work of the Station.

Plant Distribution.—During spring, 1946, the variety Q.47 was distributed to all growers who made application in the Qunaba, Millaquin, Fairymead, Bingera and Gin Gin mill areas. Approximately 180 tons were planted out in this way. To date reports of growth have been excellent although a few indifferent strikes were experienced with plants from one source. Early figures suggest better than average early sugar and this factor is an important one if confirmed. Q.47 appears to be a good one-year or standover type and is capable of thriving under harsh conditions. The varieties Q.28 and Q.52 were planted out in farm propagation plots to the limit of plant supplies so that distribution in 1947 might be achieved.

The only new varieties introduced during the year were Pindar, Orion, and Q.53 from Palmerston, Co.301, from Childers and Q.50 from Mackay.

Experiments Harvested during 1946 Season.—Exploratory and confirmatory trials with new varieties formed the major part of the station experimental work during the year. Two yield-observation trials, a plant and a first ratoon, were harvested, but the combined effects of drought and frost on the growth of the varieties rendered the results of little value. In the first ratoon trial, which included "D" seedlings, Q.28, Q.44, Q.45, Akbar, Eros, Trojan, and Vesta with Q.42 as the standard of comparison, the varieties Akbar, Q.44 and Q.45 died completely and gave no harvestable cane. The Q.42 stood up best to both drought and frost, although in actual cane production it was exceeded by D.15, D.65, D.69, and D.74. The early frosts indicated that Q.44, Q.45, Trojan, Vesta, Akbar, and Eros were very frost susceptible. The trial was ratooned so that further information might be obtained from the second ratoon crop. The plant yield-observation trial contained "D" seedlings with Co.290 as standard of comparison, and this block was also drought stricken and frosted before harvest time. Nearly all the sixteen "D" seedlings outyielded the Co.290—some by 50 per cent.—in this abnormal year, but further data in average years are desirable and necessary before attempting to assess their value. The block was ratooned after harvesting.

In the plant Latin Square trial, in which the varieties Q.28, Q.52, B.50, and B.56 were compared with Q.49, drought and frost again played havoc. Yields were of the nature of 10 tons per acre and no significant differences were obtained. The sugar per acre of Q.49, however, was significantly higher than that of other varieties. The first ratoon Latin Square included Q.25, Q.49, Q.52, and M.1900 with Q.42 as standard of comparison. Yields in this trial were also adversely affected by drought and frost; four of the plots of M.1900 having no harvestable crop. Q.49 was significantly superior to Q.52 and Q.25 in this trial. Analyses of sugar per acre figures also placed Q.49 at the head of the list as it was significantly better than Q.25 and Q.52.

The fertilizer trial on Block B3 was harvested as a first ratoon crop. In this trial two levels of potash and phosphoric acid were used in such quantities as to correspond to 3 cwt. and 6 cwt. per acre of No. 3 mixture. In the plant crop, harvested the preceding year, a slight response to potash was recorded, and, in this first ratoon crop a highly significant increase, due to the application of the lower level of potash, was obtained. The very adverse season undoubtedly affected the nutrient uptake and the failure of the high potash dressing to increase the yield significantly appears ambiguous. The crop has been ratooned again without further dressings of potash and phosphate. No increase due to phosphate was recorded and this is in agreement with previous experience on this soil type.

The minor element trial on Block B.6 on a 5 x 5 Latin Square layout was designed to measure any crop increases accruing from the elements copper, zinc, boron, and manganese when applied in addition to the normal fertilizer dressing. Although an average crop was harvested there were no indications of beneficial effects from the minor elements. The block has been ratooned and the treatments repeated for a first ratoon crop.

The fertilizer and plant residue trial on Block E4 is now in its third rotation. In the first planting no fertilizer responses were evident until first ratoons, when slight gains from potash and large increases from nitrogen were obtained. The second ratoons showed pronounced crop gains from both elements. In the second rotation no significant responses were registered in the plant crop but in first ratoons PK, NK, and NPK all exceeded the control at the 1 per cent. level of significance, while NK and NPK exceeded PK at the 5 per cent. level. In the third rotation there were no significant differences due to fertilizer treatments. It would appear that the spell during inter-rotation fallowing is, to date, responsible for a build-up of sufficient nutrients to supply the requirements of a plant crop of cane. In the third rotation the plant crop was a small one owing to the drought and its plant food requirement would have been proportionately low. At no time have the broad cultural treatments, (*a*) no trash conserved, no green manure, (*b*) green manure, and (*c*) trash conserved plus green manure, shown any significant differences.

The permanent trash trial on block E3a has now been harvested eight times, covering four rotations. On the trash plots all cane is cut green and plant residues conserved and eventually ploughed in. On the no-trash plots all residues are burnt. Over the eight crops the trash plots have aggregated 237.6 tons per acre compared with 236.2 tons per acre for the no-trash area, or 29.7 and 29.5 tons per acre per crop average. To date, therefore, there is no signficant difference in yield due to trash conservation on this red volcanic soil type and under the existing climatic conditions. The experiment will be continued, however, as a long range investigation.

Continued failure of the Station irrigation water supply resulted in the 1946 seedlings being planted in the field in November under dry conditions. About 2 per cent. died but the remainder made only a poor crop and normal selection procedure will not be practicable. The heavy wet season in 1947 raised the underground water table considerably and normal pumping should be possible for the next seedling generation.

New Experiments Initiated during the Year.—A trial was designed to measure the effects of applications of rotary filter mud to the soil. Mud was applied to strips in the field at the rate of 25 and 50 tons per acre, leaving control strips for comparison. This was put on prior to ploughing out the old stubble and subsequent ploughings mixed it intimately with the soil. At planting time fertilizer treatments were superimposed on the mud strips so that the effects of the mud dressings with or without fertilizer could be measured.

Legumes.—A trial with six varieties of velvet beans supplied by the Director of Agriculture was planted during the year. These included White and Black Maritius, Somerset, Marbilee, Jubilack and Smith. They made remarkably good growth during a dry summer and exhibited strong drought resistant qualities. Weighings from each plot were made and each variety was analysed. All seed was collected for further farm trials and for propagation of seed stocks. The ability of these velvet beans to develop good crops in an average year should popularise them with farmers, who are finding it increasingly difficult to obtain satisfactory cover crops from Poona pea owing to the depredations of bean fly.

The departmental plant breeder supplied small quantities of 29 varieties of cow pea for bean-fly resistance trial work. Several of these showed high resistance and a longer maturing period than Poona pea and seed was collected for further trial.

Laboratory Work.

The Bundaberg soil survey was continued during the year and a large number of soil analyses carried out. The impetus given to irrigation by the drought resulted in considerable numbers of water samples being analysed for anegrowers and at the same time a comprehensive water quality survey of the irrigation supplies was made.

The number of laboratory samples handled during the year is summarised as follows:—

Cane samples—	
Station	206
Farmers	127
Irrigation waters	195
Soil survey samples	78
	606

Summary of Crops Grown on Station.

Varieties harvested 1946 season—	Tons.
Q.48	80·4
P.O.J.2878	70·2
C.P.29/116	23·6
Q.49	5·0
Q.42	4·1
Q.25	2·0
Co.290	1·4
Seedlings	40·9
Total	227·6

	Tons.
Plant cane (S.O.) harvested	28·9
Plant cane	160·0
First ratoon	38·7
Total	227·6

	Tons.
Total cane harvested for mill	227·6
Used for plants on station	1·0
Used for plants off station	..
Used for samples	1·5
Total Crop	230·1

Total acreage harvested	17·945
Average tonnage per acre	12·7

WORK OF THE FIELD STAFF.

By W. J. S. Sloan, Agronomist.

All officers of the field staff who were serving in the forces have now been discharged and have resumed active duties with the Bureau. Mr. R. A. Abbott, who rejoined the Bureau in August, 1946, was transferred as Field Assistant to Gordonvale. Mr. E. A. Pembroke, Field Assistant, who was a member of the field staff at Mackay prior to enlisting, returned to duty there in October, 1946. Mr. O. W. D. Myatt was a new appointment to the field staff and was stationed at Bundaberg as an Adviser in Cane Culture in August, 1946.

During the year a much larger experimental programme was handled by field officers than for some years past. This covered a wide range of investigation, including varietal trials and propagation plots, fertilizer trials, lime trials, weedicide trials, disease and pest trials, in addition to a number of fertility surveys. The normal volume of advisory services was maintained, and, although less time was required for supervision of fertilizer rationing, an appreciable amount of time was devoted to the inspection of farms and areas for soldier settlement. Field officers in the respective centres took an active part in the Field Days at Mackay and Meringa, which were the first held for some years. These were well attended and proved very successful. Senior field officers attended the Staff Conference which was held at Innisfail during the period 30th April to 7th May, 1947, when the Queensland Society of Sugar Cane Technologists was in session at that centre. Details of various field trials were discussed and the field programme for 1947-48 was finalized.

The setting out and harvesting of trials in the expanded field programme entered upon in 1946 and 1947 has already placed a heavy burden on the field staff, and with additional varietal trials in 1948 as well as the harvesting of the ratoon plots of the earlier trials, which cover many phases of investigation, the resources of the field staff will be fully taxed to handle all the work. Transport facilities continued to present problems during the year and until this position is corrected and the present field staff is augmented, it is unlikely that any further new, large-scale investigations can be undertaken in the near future.

The 1946 Harvest.

The 1946 harvest was carried out and completed under very dry, harsh conditions. While the weather caused little interruption to harvesting other than to increase greatly the fire risk, climatic conditions caused steady deterioration of the cane and were most unfavourable to successful ratooning. Some mill areas crushed tonnages which were very much below average. Over a large area, C.C.S. figures in many varieties were erratic and some exceptionally low returns were received. A considerable tonnage was condemned as unfit for harvest because of either dead cane or sub-standard sugar content. Severe frosts in the Central and Southern districts greatly accentuated cane deterioration which was already substantial due to the dry conditions.

Growth of the 1947 Crop.

Growing conditions for the 1947 crop have not been good and the yield is unlikely to exceed greatly the 1946 harvest. Overall, rainfalls have been below average. The latter half of 1946 was exceedingly dry and the growth of ratoons and autumn, 1946, planted cane was severely restricted, while much spring, 1946, planting germinated badly or was a complete failure. The wet season was delayed, but in some areas record falls were registered in February and March. Flood and wind damage fortunately was negligible. Cane growth responded remarkably well, although stooling was poor. Dry conditions again intervened in late autumn and early winter, particularly in the Central and Southern districts, and growth was soon checked. At the end of June, crop prospects in the Central districts were particularly poor. Very free arrowing has characterized the 1947 crop throughout the sugar-growing belt, and no great increase in yield can be expected in many fields even if the winter is mild and moist. Early figures from the few mills which commenced crushing in June, and maturity sampling in other areas, indicate that the sugar content of cane will be very satisfactory.

Details of crop progress in the main cane growing areas are as follow:—

Northern Districts (Ayr to Mossman).—Following on the previous unfavourable season, the drought during the second half of 1946 created a serious position, Hambledon and Mulgrave areas being affected particularly severely. Ratoons had a very poor start and many failed completely, while germination of plant cane over large areas was unsatisfactory and some fields were worthless. Where reasonable strikes were obtained, growth of the young plants was badly stunted by abnormally low soil moisture, and weak stooling was characteristic of much of the

cane. After heavy rains in early 1947, shooting of the eyes and stooling from above ground were common, but cane generally made rapid growth. Damage due to flood or wind was of no consequence and heavy yielding crops have developed on low lands where the cane is frequently damaged by flood waters. Rainfall was below average, but falls in May and June were sufficient to keep the cane growing and by the end of June, prospects for reasonable yields were much better than expected earlier in the year. Arrowing in all varieties occurred over a wide area. Maturity sampling indicated that the sugar content of cane was satisfactory.

Although conditions in autumn 1946 for the main planting in the Burdekin were not good, and considerable trouble was experienced with germinations, the cane made excellent growth with repeated irrigations. Record rain fell in February, but although there was some minor local flooding the excess water drained away well and damage was small. Yield prospects at the end of June were most encouraging and sugar content of cane, as indicated by the figures of the mills which commenced crushing in June, was good.

Central Districts (*Proserpine-Mackay-Sarina*).—The season was one of the most disastrous experienced in these districts. Less than 6 inches of rain were recorded at Mackay for the seven months July, 1946, to January, 1947. As the April-June, 1946, period was also very dry and subsoil moisture was very low, combined with an unusually cold winter, growing conditions for cane were most unfavourable. Many ratoon fields responded poorly and had to be ploughed out, whilst the growth of those that were left and that of the cane planted in the autumn of 1946 was stunted severely. Spring 1946 planting was restricted to a large extent and much less than the normal acreage was planted. The crops revived well after good rains in February and March, and made rapid growth, but stooling was poor. Some local flooding occurred in February and severe damage resulted in isolated instances in low river areas. Dry weather in late autumn and early winter again checked growth and yield prospects were unfavourable by the end of June. Sampling indicated that the sugar content of cane was good. Profuse early arrowing appeared in all mill areas.

Southern Districts (*Bundaberg to Rocky Point*).—Cane crops planted in autumn, 1946, were severely checked by harsh growing conditions in the winter, which was dry and unusually cold. Moderate rains in September and October enabled a large acreage to be planted, but conditions generally were not favourable for growth until late January, 1947. Torrential rains occurred in February and early March, causing severe soil erosion in the Isis mill area especially, where an abnormal area of land was in bare fallow preparatory to planting. Some local flood damage also occurred in other areas. Growth after these rains was rapid and further rains in early autumn kept crops growing and prospects for average yields were fair. Dry conditions followed, however, and extensive arrowing developed in most commercial varieties, particularly C.P.29/116, with the result that harvest prospects were less promising by the end of June. Fortunately no severe damage from frosts occurred. Maturity sampling showed very satisfactory sugar content of cane.

Plantings for the 1948 Crop.

In all the Northern areas, almost ideal conditions for land preparation and planting prevailed during the 1947 autumn. Germinations of plant cane were good, and prospects for average yields in 1948 were bright. Fair strikes were also obtained with the limited autumn plantings in Central and Southern districts, although in the latter area plantings were made later than usual.

Varietal Trials.

More varietal trials were harvested in 1946 than in the previous year and the number of trials for harvest in 1947 will again be greater. The results are summarised as follows:—

In a plant trial at Mossman, cut at 14½ months, in which all varieties made good uniform growth, Trojan and Eros were on a par, but both exceeded P.O.J.2878 in yields of sugar per acre.

Growth was only fair in a plant trial at Mourilyan, cut at 14 months, in which Eros performed better than both Badila and the Hawaiian variety 32-8560, the latter variety particularly being unimpressive. A plant trial at Tully, cut at 13 months, using similar varieties, made better growth generally. Badila and Eros performed equally well, and both outyielded 32-8560.

The Bureau seedling, Q.50, was outstanding in a plant trial at Mackay, which suffered severely from a late drought. The trial was cut at 14 months and also included the varieties Trojan, Q.28, and two Bureau seedlings under trial, A.130 and A.147. Q.50 was again superior in a plant trial at Sarina, cut at 11½ months, which was also badly affected by dry weather late in the growing season. Other varieties in the trial were Q.45, P.O.J.2878, Comus and Trojan.

There were no significant differences between the performances of Q.47, Q.48, Q.49 and P.O.J.2878 in a plant trial at Bundaberg, cut at 14 months. In another plant trial at Bundaberg, cut at 13 months, there was little difference between Q.25, Q.49, and C.P.29/116 in yield of sugar per acre, and all were better than Co.290 and Q.48. The same varieties with the addition of Q.47 were included in another trial at the same centre, and Q.25, Q.47 and C.P.29/116 gave the best performances.

Two trials were placed at Nambour for the purpose of observation on the frost resistance of Q.28, Q.42, Q.48, C.P.29/116 and Co.290. In one trial cut at 11 months, the net monetary returns from Q.28, Q.42 and C.P.29/116 were on a par and better than Co.290 and Q.48, whilst in the other trial, Q.42 was outstandingly the best variety.

During the year a large number of varietal trials for harvest in 1947 and 1948 were set out in all the main districts. Propagation plots of promising varieties and yield-observation plots of experimental cane were also planted, whilst the distribution of new varieties for the approved variety lists in many mill areas also received attention.

Isolation Nurseries.

Because of the increasing disease risk to experimental varieties, the nursery at Myola has been abandoned and a new site selected at Koah, where irrigation is available also. The new isolation nursery at Bingil Bay is now firmly established, and is being used as a clean source of plants of new varieties. A suitable area, well isolated from cane crops, has been located in the Lower Burdekin, and will be used for future plantings of small supplies of new varieties introduced to that district. Field officers continued to give full co-operation to the Pest and Disease Control Boards at Isis and Moreton in the supervision of their isolation nurseries.

Fertility Trials, Fertility Surveys, and Soil Erosion Experiment.

Two fertilizer trials, four lime trials, and three minor element trials were harvested and a large number of fertility trials covering various phases of investigation were planted.

The collection of soil samples for fertility surveys was continued for the Brisbane laboratory. These surveys were carried out at Silkwood, Airdmillan, Homebush, Oakwood-Gooburrum, and the Maroochy River district.

Maintenance, as required, and observations were continued on the soil erosion control experiment set out at Childers in 1946.

A summary of the results of all these experiments will be found under the section, "Soil Technology."

Pest and Disease Control Experiments.

Numerous observation trials in connection with the investigation of the new insecticide "Gammexane" were planted. These covered trials to examine phytotoxic effects on cane and cover crops and the most suitable rates and methods of application of the material to obtain best economic control of cane grubs and wireworms.

Trials to obtain further information on various phases of chlorotic streak and mosaic diseases were also handled as well as several trials concerned with the beneficial effect on germination of treating plants with mercurial compounds.

A summary of the results of this work will be found under the section, "Report of the Division of Entomology and Pathology."

Cultivation Practices.

The severity of the drought of 1946 throughout the sugar-growing belt greatly stimulated interest in the irrigation of cane, because the contrast between well-irrigated crops and those grown under rainfall conditions was very striking. In the Lower Burdekin, where irrigation facilities are fully developed on most farms, the 1947 harvest will be an excellent one, while non-irrigated crops of other mill areas in Queensland are, for the most part, disappointing. In the absence of disastrous floods and cyclones, irrigation assures that a good crop will be harvested from year to year, independent of rainfall, and in districts outside the very wet area irrigation has a strong appeal to cane growers.

In the Central and Southern districts particularly, the search for suitable underground water supplies by farmers without irrigation facilities has been pursued energetically. Even within the heavy rainfall belt from Tully to Mossman a number of growers last year hastily improvized irrigation equipment for pumping from open water supplies. However, inability to secure proper equipment and late preparation of land for irrigation prevented worthwhile results being achieved in most cases. It is very doubtful whether the purchase of irrigation equipment for canegrowing and the cost of installation would be an economic proposition over a number of years in these districts.

Generally speaking, there is a tendency to decrease the number of ploughings used in pre-planting land preparation. In the Mackay district many growers rely on grubbing and surface cultivation with the disc harrows, while in some Southern areas the trend is towards light to deep treatment of the land with the rotary hoe, followed by grubbing.

In the Far Northern areas, less cane was grubbed last year than has been the case for some time. Where it was practised during the low soil moisture conditions of the greater part of the year cane showed distress. The grubbing-cultivation trials, which it was hoped to establish in the spring of 1946, had to be abandoned because of the abnormally dry conditions, but it is intended to initiate them in 1947.

The practice of consolidating soil over setts in the drill has continued to gain favour in many areas. The methods of effecting soil compaction vary, but the use of light, rubber-tyred, tractors with the wheels running in the drills appears the most suitable. A number of rollers used behind cutter-planters seems to be too light for the purpose. In the Burdekin it is a common practice to irrigate down the drills after planting to assist germination, but in autumn, 1947, with better than usual pre-planting soil tilth, compaction of the soil in the drill over the setts gave very satisfactory strikes.

Growing cane in beds of various widths is a common practice at Mackay, but recently some growers have abandoned the bedding system and are relying on well-graded land for drainage. Systematic bedding at the right time is a cultural measure recommended for wireworm control, and although grading may give adequate drainage it is possible that control of wireworm populations may not be so good as with correct bedding practices.

Green Manure Crops.

In general, green manure crops were a failure in the 1946-47 season. Crops were not established until very late in 1946 because of the drought, and Poona pea, in particular, was severely affected with wilt during the wet season, before the plants had made much growth.

The difficulties of establishing cover crops are especially acute in the Burdekin, where the annual rainfall is very unreliable and poorly distributed. In a small trial, fairly satisfactory results were obtained by growing an early Poona pea crop with irrigation, allowing the plants to seed, then harrowing and rolling the field just before the wet season to obtain volunteer second growth.

Promising results have been obtained on the Sugar Experiment Stations in sorting out a number of different strains of cowpea crosses and several velvet bean varieties; when seed supplies have been built up, the intention is to place the best varieties out in farm plots for further testing.

Weedicides.

During the year, small supplies of a new type or hormone-like selective weedicide were made available to the Bureau for experimental purposes. The basis of these weedicides is 2, 4-dichlorophenoxyacetic acid. In preliminary trials, the weedicide was used as a spray mainly at the rate of 1 to 2 lb. of the active principle per acre. It was found that a large number of weeds could be killed if treated when they were young and growing rapidly. The list of weeds killed included well-known species such as Noogoora burr (*Xanthium pungens*), star burr (*Acantho-spermum hispidum*), khaki weed (*Alternanthera repens*), bell vine (*Ipomaea plebeia*), goatweed (*Ageratum conyzoides*), star of Bethlehem (*Ipomaea Quamoclit*), and red pigweed (*Portulaca oleracea*). All the grass weeds, however, were resistant, as also was wild verbena (*Heliotropium amplexicaule*). In several trials nut grass (*Cyperus rotundus*) was killed back to and including the first nut.

In a few special plots where strong concentrations were used it was observed that the resistance of highly tolerant weeds such as wild verbena was not reduced with increased concentrations up to four times that of the recommended strength, but a better and more rapid kill was effected with susceptible but somewhat tolerant species by the stronger sprays.

The hormone-like sprays in trials have not proved to be as effective as the standard arsenical spray used in the Moreton Mill area for late control of weeds, particularly goatweed.

New Agricultural Implements.

Interest in the mechanization of all canegrowing and harvesting operations has continued to be maintained at a high level. Tractors and tractor-drawn equipment are purchased readily as soon as they become available. In all areas outside the very wet belt from Tully to Gordonvale the use of cutter-planters continues to spread.

Labour shortages in the industry constitute an acute problem and the mechanization of cutting and loading cane is a matter of considerable interest to all growers.

Tierney's Bundler.—This is a hay rake converted by Mr. P. F. Tierney, Innisfail, for use as a cane bundler in conjunction with mechanical loading by the loader which has already been developed by him.

Fertilizer Spreader.—This machine was designed by Mr. G. Camuglia, Innisfail, for the specific purpose of distributing sulphate of ammonia but it may be used successfully with all common types of fertilizer. A description and illustration of this machine will be found in the 1947 Proceedings of the Queensland Society of Sugar Cane Technologists.

Publications.

Numerous articles were published by field officers in the Cane Growers' Quarterly Bulletin and, in addition, the following articles were contributed to the 1947 Proceedings of the Queensland Society of Sugar Cane Technologists:—

King, N. J.—"Methods for Dealing with Dead Cane Crops."

Sloan, W. J. S.—"The Weed Problem."

REPORT OF THE COMMITTEE ON SEEDLING PROPAGATION.

By C. G. Hughes, Pathologist.

Although reports from other districts during the winter just past told of the farmers' concern with the excessive arrowing in the commercial canes, the arrowing at the Northern Experiment Station was not very satisfactory from the crossing point of view. The drier end of the Mulgrave Mill area, in which the Station is situated, suffered very severely from the drought during the spring and early summer of 1946 and a large proportion of stools in some fields did not survive. The non-irrigated blocks on the Station were badly affected and large gaps resulted. Unfortunately, the main plantings of parent canes were in these fields, and as a consequence, the numbers of stools which might have produced useful arrows were considerably reduced. The reduction in arrowing potential due to stunting of the stools and the gaps in the fields made it necessary to go away from the Station for a large percentage of the arrows. It was fortunate that the arrowing in the Bureau plot at Freshwater was reasonably satisfactory, although somewhat less than normal, and sufficient arrows were obtained for the majority of the desired crosses. There were, however, shortages of arrows of some important canes: P.O.J.2878, which is an important parent, arrowed very lightly at both the Station and Freshwater and Co.290, as is typical of this cane in poor arrowing seasons, produced arrows which died before setting seed.

Weather conditions during the actual crossing work were reasonably favourable and there were very few losses of arrows through excessive dampness or high winds. As in previous years the majority of the crosses were made in a weak solution of sulphurous and phosphoric acids, but several crosses with canes such as Co.270 and Q.42, which do not usually set seed well in solution, were made in the field. The crossing season extended from 23rd May to 3rd July and during that period 127 crosses were made. These are set out in Table VII., where parents bearing the letters "C," "D," "E," "F" and "G" are seedlings which have not yet been raised to the status of "Q" canes. Some of these are nobilizations of *S. robustum* canes and some have been developed from the cold-resistant spontaneums from Turkestan.

Owing to showery weather when the fuzz was ripening most of it could not be dried out of doors and had to be treated in the electric dryer. It was packed in the usual fashion and then the major part of it put into cool store for use next year. However, plantings of fuzz from certain breeding families were made at Meringa, and both there and at Bundaberg a few commercial crosses from the 1947 fuzz were planted to remedy the shortage resulting from the poor crossing season in 1946. A few tins of fuzz were sent to South Africa and Egypt.

Fuzz was sown at all three Stations during the period under review. At Meringa, there was a sowing in July, 1946, and another in March, 1947; at Mackay, there was the usual March sowing and at Bundaberg the regular sowing was made in July, 1946.

On the Northern Experiment Station, where a sowing in February, 1946, had yielded 3,249 seedlings for autumn planting on good but non-irrigable land, the July sowing gave over six thousand seedlings for planting out on the Station on blocks which could receive the customary irrigations. Arrangements were also made to plant out seedlings from this batch on a farm at Bartle Frere, near Babinda. Families selected were those expected to produce short, stocky canes suitable for growing in that very wet area. Strangely enough it was drought rather than excessive wet which delayed the latter planting until December, but the seedlings soon became established. A total of 3,853 seedlings representing fourteen families was planted at Bartle Frere. Seedling blocks on the Station were treated with "Gammexane" for the first time and grub damage was reduced to a minimum. Selections were made in June but, since the plant blocks of original seedlings are to be ratooned, further selections will be made next year. The seedlings at Bartle Frere made very poor growth, chiefly owing to the lateness of the planting, but selections were made and the block has been ratooned. The seedlings from the February, 1947, sowing were planted on the Station during the first week of June.

At Mackay, a total of 6,910 seedlings was put out into the field in late July, 1946. These were irrigated and, despite the early dry weather and short wet season, a reasonably selectable crop was available in July, 1947. The usual summer sowing of fuzz was made in March, 1947, and seedlings from this batch are now well established on both the Station and a block of good alluvial soil on a farm at Lansdowne Road.

The sowing at Bundaberg in early July, 1946, encountered severe winter conditions and minimum temperatures in the glasshouse and on the benches were much lower than usual. In view of the low temperatures and the risk of frost, potting out was delayed until the second week in August, but, even so, a sharp frost caused the loss of over one thousand newly potted seedlings. There was no irrigation water available when the seedlings were planted out during the early part of November, but the diminishing soil moisture was replenished by a storm and the seedlings soon became well established. However, conditions were dry for most of the growing period and as the irrigation water was still unavailable the seedlings suffered; as a result, only three particularly hardy families, which were represented by approximately 600 seedlings, had yielded selectable seedlings in any number when selections were made in spring, 1947. The rest of the seedlings, numbering nearly 5,000, were very stunted.

The plant yield-observation trial of seedlings at Meringa made poor early growth in spite of some irrigation. With the heavy rain in February the growth improved considerably and by harvest time a number of the seedlings were showing greater vigour than the standard. A few of the seedlings gave promise of good early sugar. At Mackay, a trial of the same type, despite the poor season, has shown five seedlings to be of some promise. At Bundaberg, there was no plant yield-observation trial since the effects of the drought in 1946 had been so severe that no plantings were made on the Station last year.

The "E" seedlings in the ratoon yield-observation trial at Meringa after producing a poor plant crop came away slowly in the ratoons with a few canes failing entirely. The growth improved considerably during the wet season and several varieties have been selected for further testing. At Mackay, seven "E" seedlings were selected for testing in further trials. At Bundaberg there are both first and second ratoon trials; they have yielded ten seedlings for further planting.

The randomized block trial of "D" seedlings, planted at Meringa in 1946, germinated well and subsequent growth has been good. Several of the seedlings show promise both in this trial and in plantings made on commercial farms, but final selections will not be made until results from another year's cropping are available. The surviving "B" canes at Meringa are out on commercial farms for further testing. At Mackay, B.174, the only "B" cane remaining, has been grown in a Latin Square trial with P.O.J.2878, Q.28, Q.50, and Trojan but results are not yet available. At Bundaberg, B.50 and B.56 are being compared with Q.28, Q.49 and Q.52; the seedling B.50 shows some promise, but B.56 has proved to be susceptible to downy mildew and cannot be grown where that disease is present. Ten Bundaberg "D" canes have been planted in small amounts on commercial farms.

Following are brief notes on some of the newer varieties in the Northern, Central and Southern districts:—

Northern Districts.

Q.44 has yielded some very heavy crops during the past dry season on land which in normal years suffers considerable flood losses. Figures for sugar, however, have been low early in the season and there has been some difficulty in harvesting owing to the serious lodging. Leaf-scald disease is causing some concern in this variety, particularly as the disease is most serious in areas which appear to suit this cane.

Q.53 has shown itself to be dangerously susceptible to leaf-scald disease and cannot be grown where that disease is present. Its growth under the harsh conditions this year was only fair, but its high sugar early in the season may make it a special purpose cane.

Q.54 was the only cane given a "Q" number during the past year. It was found a few years ago in the Innisfail area being grown as S.J.4. It closely resembled that cane and the farmers then growing it did not separate the two varieties. However, when tested in a resistance trial this other cane showed itself much more resistant to gumming disease than S.J.4 and so was suggested as a possible useful cane where gumming was a threat to the standard variety. Q.54 is a comparatively slow, although sure, germinator, and produces a slightly thicker stick than S.J.4. It trashes freely, ratoons well, but does not stool quite so heavily as S.J.4. The foliage is often markedly freckled, but it lacks the chlorotic leaf-tip markings characteristic of S.J.4.

Trojan has resembled Q.44 this season in often producing very high yields with low early sugar content and also because harvesting difficulties have occurred with the tangled crops. Cover has been poor and it has ratooned poorly on the second-class soils. In the drier Northern mill areas large areas of Trojan have been planted this year,

Central Districts.

P.O.J.2878 is hardly a new variety but is worthy of mention here since it has only recently been approved for planting over the whole of the Mackay district. It is susceptible to downy mildew and when this disease threatened to cause serious losses P.O.J.2878 had to be confined to the isolated disease-free northern end of the district. The reintroduction of this cane has only been made possible by the eradication of the disease. It is a useful variety on the heavier better-class soils and where grubs might cause losses.

Q.50 was placed on the approved list for the mills of the Mackay district this year and nearly two-thirds of the Mackay farmers are arranging to plant it. It germinates well, even under dry conditions, and ratoons are reliable. It has again shown some red rot at harvest time, but the last two seasons have been abnormally dry and red rot may not cause much damage in a normal year.

Trojan is being distributed to farmers at Mackay this year and will be placed on the approved variety list in 1948. However, it is probable that it will be restricted to the better-class lands.

Southern Districts.

Co. 301 has grown vigorously, giving heavy stools with an excellent cover. The stalks are thin, however, and sugar tests have been low in the early months of the season. Co.301 is resistant to gumming disease and is a reliable germinator and ratooner.

C.P.29/116 has arrowed profusely this year in all Southern districts. Despite this habit and its low sugar early in the season, it is now one of the major canes and formed a large proportion of all plantings made this year.

Vesta is showing promise in the Moreton area and is to be put on the approved list in 1948.

Q.28 has grown well in many plantings in the South. It is more resistant to red rot than Co. 290 and may displace that cane in many areas. Although sometimes showing cold chlorosis it is not regarded as unduly susceptible to frost damage.

Q.52, although showing excellent agricultural characteristics and producing heavy crops, is not being distributed this season owing to extreme susceptibility to red rot. It will be kept under observation for another year.

Varietal Statistics.

The varietal composition of the 1946 crop in the four main districts and in Queensland as a whole are given in Table IX. and, as a matter of interest, the distribution of each variety through the canegrowing areas is also included. The total tonnage of cane crushed for the season is much lower than the average for the past decade and is only three hundred thousand tons more than the disastrous 1943 crop. An analysis of the district figures which make up the State total shows that the largest proportional decrease occurred in the Bundaberg and South district. This area usually yields about 20 per cent. of the State total (about the same as the Proserpine and Mackay area), but in 1946 it produced only 12·1 per cent. Largely as a consequence the tonnage of P.O.J.2878 harvested was reduced and this variety was relegated to fourth position in the State; for several years previously it had been the second most important cane. It is difficult to estimate the future position of this cane; on the one hand it will probably increase in the Mackay district, but competition from the new varieties in the South, particularly C.P.29/116 a nd Q.49, may well cause a permanent recession in the acreage grown there.

The variety Badila again heads the list, producing about the same percentage of the Queensland crop as in 1945. As forecast in this report last year, the Mackay-bred Q.28 is now second to Badila. It was expected that it would have produced 500,000 tons, but growing conditions were unfavourable during the latter part of the season and the tonnage crushed was just under 440,000. The variety yielded over two-fifths of the Mackay crop and may be approaching saturation point there; further north it is not likely to be grown on a large scale, but in the South it is showing considerable promise and an increase in tonnage can be expected in the near future. Trojan is in third place with 9.6 per cent. of the State's crop. Practically the whole tonnage of this variety came from the North of Townsville, which area suffered a severe drought and heavy grub infestation during 1946. In normal years the yields there would be expected to be higher and the tonnage of Trojan would likewise be increased. There have been extensive plantings of this variety in the North during the present season and the variety will probably be extended in all areas, except in the South; it is probable that tonnages yielded by this cane will show an increase over the next few years. The old standard canes, E.K.28, H.Q.426 and M.1900S., are still prominent but are continuing the decline noticeable over the last few crops. Co.290 had its tonnage reduced by the drought in South Queensland, but it is probably on the down grade in both the Mackay and Southern areas. The variety

S.J.4, which has maintained its position solely because of its popularity at Mossman, N.Q., will drop sharply in tonnage yielded owing to restrictions which have had to be placed on its planting in that mill area when it became infected with gumming disease. Despite the drought in the southern parts of the State the cane C.P.29/116, which is grown only there, yielded over 100,000 tons to become as important as Co.290 in the South and to form 2.7 per cent. of the total yield of the State. In 1945 it had yielded less than Q.25, but for 1946 produced over three times the tonnage of that cane. It is expected that the figures will be even higher for the 1947 crushing and it should easily be in second place to P.O.J.2878 in the Bundaberg and South division. Among the remaining varieties, it is noted that S.J.16 and the recently reintroduced B.208 have increased in popularity on the Burdekin and that Q.49 makes its first appearance on the list. This last-named cane resembles its male parent, P.O.J.2878, in many respects but it is resistant to Fiji disease. It shows promise of being a very useful cane in South Queensland.

The changes in the varietal composition of the crop are reflected in the figures obtained when the varieties are arranged on the basis of the country of origin (Table VIII.). Queensland has increased its percentage of the crop to 42·5 and now leads New Guinea by nearly 16 per cent. as a country of origin. Queensland exceeded New Guinea for the first time as recently as 1944; in 1945 the margin was increased and for the crop under discussion, its lead has become even greater. The low yield of P.O.J.2878 resulted in a very poor third for Java. Other countries, generally represented by one variety for each, showed no change in order except that the United States of America, as the source of C.P.29/116, has again improved its position.

Table VII.—Crosses Effected during the 1947 Cross-Pollination Season.

Females.	Males.
Atlas	Q.36.
Badila	C.279, F.363, Q.27, Uba Marot.
Cato	C.279, E.255, 28N.G.253.
Co.270	Badila, Comus, E.282, E.K.28, J.B.3, P.O.J.2878, Q.39.
Co.281	C.P.29/116, D.216, E.281, F.202, F.300, M.1900S, P.O.J.2878, Q.34.
Co.290	P.O.J.2878.
Co.364	E.282.
C.P.38-782	Pompey.
C.P.39-424	Pompey.
D.225	D.216.
D.285	Comus, C.P.29/116, G.257.
E.256	28/N.G.253, Uba Marot.
Eros	P.O.J.2878.
F.201	Badila, Comus, E.282, P.O.J.2940, Uba Marot.
G.253	Pompey.
G.254	Comus, E.282.
G.256	C.P.29/116, Eros.
Korpi	C.279, F.363, Uba Marot.
M.1900S.	Co.281.
N.G.16	F.300.
N.G.24	F.363, Uba Marot.
28N.G.289	E.282.
Pompey	C.P.39-424, C.P.38-782, G.253, G.255.
Oramboo	F.363.
P.O.J.100	C.P.29/116.
P.O.J.2714	C.P.29/116.
P.O.J.2722	C.P.29/116.
P.O.J.2725	Badila, Co.290, Comus, C.P.29/116, D.216, Eros, F.202, F.300, F.363, G.253, Jason, 28N.G.253, Q.27.
P.O.J.2727	C.P.29/116.
P.O.J.2875	Co.290, C.P.29/116, G.257, H.Q.409.
P.O.J.2878	Co.281, Comus, Eros, G.255, G.257.
P.O.J.2883	Jason, 31-2484.
Q.10	Uba Marot.
Q.27	Badila, C.279, E.281, F.363, Q.39.
Q.37	C.P.29/116, G.255.
Q.42	C.P.29/116, E.255, P.O.J.2878, Uba Marot, 31-1389.
Q.44	Badila, Comus, E.257, F.300, F.363, G.257, J.B.3, 28N.G.253, Trojan.
Q.47	C.P.29/116, E.281, F.363, P.O.J.2878.
Q.50	C.P.29/116, E.281, F.363, P.O.J.2878.
S.J.4	G.257.
Trojan	Co.281, Comus, C.P.29/116, E.257, E.K.28, Eros, F.363, H.Q. 409, J.B.3, P.O.J.2878, Q.31, Q.41.

Table VIII.—Composition of the 1946 Crop, on the Basis of Country of Origin of Varieties.

Country of Origin.	Tonnage Harvested.	Per Cent. of Crop.
Queensland	1,579,307	42·5
New Guinea	990,730	26·65
Java	583,564	15·7
India	229,344	6·2
Mauritius	163,177	4·4
United States of America	101,880	2·7
Fiji	41,046	1·1
British West Indies	26,869	·7
Unclassified	2,071	·05

TABLE IX.—VARIETAL COMPOSITION AND DISTRIBUTION IN THE FOUR MAIN DISTRICTS AND THE STATE AS A WHOLE: 1946 CROP.

Districts. / Varieties.	North of Townsville.			Giru and Burdekin.			Proserpine and Mackay.			Bundaberg and South.			Whole State.	
	Tons.	Per Cent. of		Tons.	Per Cent. of		Tons.	Per Cent. of		Tons.	Per Cent. of		Tons.	Per Cent of Crop.
		Crop	Variety.		Crop.	Variety.		Crop.	Variety.		Crop.	Variety.		
1. Badila	655,531	41·0	66·4	306,632	50·3	31·0	25,845	2·4	2·6	..	..	..	988,008	26·6
2. Q.28	..	..	..	..	..	..	438,617	41·4	99·9	421	0·1	0·1	439,038	11·8
3. Trojan	357,421	22·4	100·0	..	..	..	100	..	..	..	..	..	357,521	9·6
4. P.O.J.2878	28,584	1·8	9·3	3,362	0·6	1·1	106,654	10·1	34·8	168,025	37·5	54·8	306,625	8·2
5. E.K.28	..	..	..	139,074	22·8	57·4	103,266	9·7	42·6	..	..	..	242,340	6·5
6. Co.290	..	..	..	..	..	..	125,130	11·8	54·6	104,214	23·2	45·4	229,344	6·2
7. H.Q.426	152,322	9·5	74·1	23,994	3·9	11·7	29,297	2·8	14·2	..	..	..	205,613	5·5
8. M.1900S.	..	..	..	..	..	..	161,691	15·2	99·1	1,486	0·3	0·9	163,177	4·4
9. S.J.4	102,361	6·4	93·3	7,353	1·2	6·7	..	..	..	..	..	..	109,714	3·0
10. C.P.29/116	..	..	..	..	..	..	..	..	..	101,880	22·7	100·0	101,880	2·7
11. Comus	25,933	1·6	32·1	19,451	3·2	24·1	35,422	3·3	43·8	..	..	..	80,806	2·2
12. Eros	78,842	4·9	100·0	..	..	..	..	..	..	..	..	..	78,842	2·1
13. Cato	68,716	4·3	100·0	..	..	..	..	..	..	..	..	..	68,716	1·8
14. S.J.2	8,084	0·5	15·1	39,036	6·4	72·8	6,472	0·6	12·1	..	..	..	53,592	1·4
15. S.J.16	..	..	..	42,474	7·0	100·0	..	..	..	..	..	..	42,474	1·1
16. Pompey	41,046	2·6	100·0	..	..	..	..	..	..	..	..	..	41,046	1·1
17. Q.44	33,594	2·1	100·0	..	..	..	..	..	..	..	..	..	33,594	0·9
18. P.O.J.2725	7,884	0·5	26·0	..	..	..	9,637	0·9	31·8	12,761	2·9	42·2	30,282	0·8
19. Q.25	..	..	..	..	..	..	..	..	..	29,471	6·6	100·0	29,471	0·8
20. B.208	..	..	..	17,973	2·9	100·0	..	..	..	..	..	..	17,973	0·5
21. Q.42	..	..	..	..	..	..	..	..	..	14,154	3·2	100·0	14,154	0·4
22. Q.10	13,629	0·8	100·0	..	..	..	..	..	..	..	..	..	13,629	0·4
23. Q.20	240	..	2·2	8,989	1·5	82·3	1,697	0·2	15·5	..	..	..	10,926	0·3
24. Q.813	990	..	10·0	..	..	..	6,723	0·6	67·9	2,190	0·5	22·1	9,903	0·3
25. H.Q.409	9,135	0·6	100·0	..	..	..	..	..	..	..	..	..	9,135	0·2
26. Q.45	..	..	..	..	..	..	7,134	0·7	100·0	..	..	..	7,134	0·2
27. D.1135	6,160	0·4	92·9	..	..	..	474	..	7·1	..	..	..	6,634	0·2
28. Atlas	..	..	..	..	..	..	..	..	..	4,129	0·9	100·0	4,129	0·1
29. Q.48	..	..	..	..	..	..	..	..	..	3,640	0·8	100·0	3,640	0·1
30. Juno	2,522	0·2	100·0	..	..	..	..	..	..	..	..	..	2,522	0·1
31. B.147	2,262	0·2	100·0	..	..	..	..	..	..	..	..	..	2,262	0·1
32. P.O.J.213	..	..	..	..	..	..	..	..	..	2,260	0·5	100·0	2,260	0·1
33. Q.49	..	..	..	..	..	..	..	..	..	2,243	0·5	100·0	2,243	0·1
34. P.O.J.2714	..	..	..	1,109	0·2	53·9	948	0·1	46·1	..	..	..	2,057	0·1
35. Oramboo	277	..	15·3	..	..	..	726	0·1	40·2	805	0·2	44·5	1,808	..
36. Q.2	1,032	0·1	100·0	..	..	..	..	..	..	..	..	..	1,032	..
37. Korpi	344	..	37·6	511	..	55·9	..	..	..	59	..	..	914	..
38. Endor	781	..	100·0	..	..	..	..	..	..	..	..	..	781	..
39. H.Q.285	..	..	..	..	..	..	626	0·1	89·7	72	..	10·3	698	..
All Others*	1,219	0·1	58·9	..	..	..	201	..	9·7	651	0·1	31·4	2,071	0·1
All Varieties	1,598,909	..	43·0	609,958	..	16·4	1,060,660	..	28·5	448,461	..	12·1	3,717,988†	..

* Includes unclassified cane, pick-up, &c.

† Includes a small percentage of condemned cane.

Report of the Division of Entomology and Pathology.

By R. W. Mungomery, Officer in Charge.

The only change in staff during the year was the filling of the previously vacant position of cadet pathologist. The appointee, in the person of Mr. B. Egan, has been able to take over some of the routine pathological work and give assistance to one or other of the senior pathologists when required.

The overall damage to cane crops by pests and diseases during the period under review was, fortunately, not severe, and the comparative freedom from serious pest activity proved to be a welcome relief, since in an unusual season such as this, droughts, floods and frosts, in different localities, were in themselves sufficient to affect crop production disastrously. The onset of dry weather towards the end of the previous growing season had not only aggravated pest attack, but had also prevented the customary control measures from being undertaken. The extension of these same conditions into the 1946-47 season eventually developed into a serious drought which continued over a large part of the summer growing period; but in contradistinction to the earlier drought effect, it was noticed on this occasion that pest populations were drastically reduced in many instances. Consequently, when relief rains ultimately fell, crops were able to make steady growth with little or no interference from pests. The scarcity of insect vectors likewise curtailed the spread of some of the more serious sugar-cane virus diseases, and this allowed roguing gangs to concentrate their efforts in cleaning up known centres of infection. The short wet season was likewise not conducive to the spread of some of the more important fungous and bacterial diseases, and with the increased substitution of resistant varieties in areas where cane diseases are present a marked improvement in the disease situation can justifiably be claimed. The one exception in this otherwise favourable picture is leaf-scald disease, since drought conditions so limited the choice of planting material that in some instances symptomless diseased cane was unwittingly planted from blocks of tolerant susceptible varieties.

Because of the embarrassing shortage of cane (particularly Badila), suitable for early planting, many districts were forced to look further afield for plants. Normally the transfer of bulk supplies of plants from district to district is not regarded in a favourable light. This attitude is dictated chiefly because of the danger of further complicating the disease position, since of the many cane diseases established throughout Queensland few fortunately are common to all districts. Indeed, the present favourable disease situation may be attributed largely to the establishment of a number of major quarantine districts in Queensland and to the prohibition of the transfer of cane from one quarantine area to another, unless under special permit. However, the sorry plight of some mill areas during April-May, 1947, demanded considerable relaxation and modification of our previous attitude towards such introductions, and accordingly, under the supervision of the Bureau's field staff, some large-scale transfers were authorized from apparently clean sources in the Burdekin district.

During this period the Sugar Experiment Stations Acts were amended to authorize the payment of subsidies as a normal power of Cane Pest and Disease Control Boards. What virtually amounted to the payment of subsidies had been an established practice for a number of years—a case in point being the payments for carbon disulphide fumigation for the destruction of cane grubs—but when some Boards desired to extend the scope of their payments it was found that under the existing regulations this was not allowable. The amending legislation therefore broadened the basis on which subsidy payments could in future be made, and it will now be competent for any Board to subsidize the costs incurred by growers in providing materials, equipment and services used for the control of cane pests and diseases in the area of its jurisdiction. Of course, the amount of any subsidy and the purpose for which this subsidy may be paid is still subject to the approval of the Minister, acting on the advice of the Sugar Experiment Stations Advisory Board.

In addition, the various powers and duties of individual Boards were overhauled and in their place a new schedule embracing all sugar-cane pests and diseases was conferred on all Boards, irrespective of whether or not any particular pest or disease occurred in the area of each Board. This action will eliminate the necessity for further representations being made by different Boards should they desire to expand their operations and carry out forms of control not hitherto undertaken in their areas.

This year was notable for the revival of the Conferences of Cane Pest and Disease Control Boards, which had been discontinued during the difficult war years. These conferences were called for the express purpose of discussing pest matters and two such conferences were held—one at Tully and the other at Innisfail. Due to difficulties associated with the organization of the first conference in 1946, it had to be held in August during the crushing period, but despite this the attendance was satisfactory. The second, which was held in May, 1947, reverted to the pre-war policy of holding such conferences prior to the crushing season, and it attracted a record number of 49 delegates. The papers presented covered a wide field and embraced rather a diversity of pests, the most important of which were cane grubs, wireworms, locusts, rats and wallabies. Other questions relating to their control aroused considerable discussion, and they will be dealt with in greater detail in the relevant sections below. Conference endorsed a proposal to collect and compile data which in future years should give authentic information on the extent and degree of pest infestations, losses incurred, and money expended in different avenues of pest control.

Observations and experimental work in connection with the various pests and diseases throughout the year are as follows:—

The Greyback Cane Beetle (*Dermolepida albohirtum* Waterh.).

With the serious and widespread grub damage of the 1946 season it was anticipated that unless weather conditions effected some control of the pest the Northern areas were due for an even worse grub visitation during 1947. However, with the early cessation of the 1946 wet season, followed by droughty weather, which continued until December, and in some places even February, 1947, there was considerable mortality in the various stages of the greyback beetle in the soil. Consequently, when rain eventually fell, only a fraction of the expected beetle flights occurred in most of the areas. In a few places where very heavy beetle concentrations were observed the subsequent weather had a marked effect on the survival of the pest. In some instances the rains which caused the flights were insufficient to maintain adequate moisture in the soil, and as a result eggs laid failed to hatch through desiccation. In other districts where the usual monsoonal rains were delayed until February, fairly large flights took place, but the beetles did not develop the normal number of eggs since they were in an apparently weakened condition due to their long confinement underground in dry soil. These February flights were the latest large-scale flights recorded in the North, and light grub damage subsequently made its appearance during May and June, 1947, thus demonstrating that drought alone does not necessarily cause complete destruction of the pest.

Due to the very late flights and the small grub infestation very little fumigation with carbon disulphide was carried out in North Queensland during 1947, only 434 acres being treated. This was in marked contrast to the 1,514 acres fumigated in 1946, and the 900 acres in 1945. The acreage damaged was estimated to be in the vicinity of 1,655 acres, and the loss sustained 7,255 tons of cane.

Greyback beetle emergence in the Mackay area was very limited and 2,680 lb. of beetles were collected and paid for by the local Board at a cost of £147.

In the Burdekin area light emergences followed the earlier irrigation of ratoon fields and the later February rains, but no infestation of any magnitude resulted.

Following on the initial successes reported last year with "Gammexane" (a proprietary brand of benzene hexachloride) for the control of the greyback beetle and grub, all research work was centred on trials with this new insecticide. Initially, it was necessary to determine whether this chemical had any serious toxic effect on cane growth; hence a number of phytotoxicity trials involving both field and pot experiments were set out some months prior to the insecticidal tests. The field trials covered a wide variety of climatic conditions and the treatments ranged from 50 lb. to 600 lb. of 10 per cent. "Gammexane" dust per acre (0·65 lb. to 7·8 lb. gamma benzene hexachloride per acre). The dressings were applied on the surface and afterwards worked into the soil with various cultivating implements. Not even the heaviest application caused perceptible damage to the resulting crops. In another small field trial, plots were treated with 10 per cent. "Gammexane" dust ranging in amounts from 100 lb. to 1,000 lb. per acre. There was a slight stunting effect discernible in the early stages in the case of the 1,000 lb. treatment, but later this effect became less apparent. Since these higher dosages greately exceed the minimum required for effective grub control it seems unlikely that the growth of any cane crop will be impaired as a result of whatever repeat applications may be necessary in the following years.

Laboratory trials were also conducted with each of the pure alpha, beta, gamma and delta isomers, using amounts up to the equivalent of 40 lb. per acre in each instance. These trials revealed that if, for any particular reason, crude benzene hexachloride had to be applied at such a rate as to cause damage to the root system, this could be obviated by applying a smaller amount of a concentrated gamma isomer product without reducing the insecticidal effect.

Further tests with "Gammexane" against greyback beetles confirmed the previous year's findings that one part per million of gamma benzene hexachloride in soil was sufficient to cause 50 per cent. death of beetles within three days.

Against the grub stage, an extensive series of trials was established to determine the minimum effective rate and the most suitable time and method of applying this insecticide in order to secure a high grub mortality and eliminate damage. The quantities of 10 per cent. "Gammexane" dust used varied from 12½ lb. to 600 lb. per acre (i.e., 0·16 lb. to 7·8 lb. of gamma benzene hexachloride) and the times of application from six months before beetle flight to two months after. In addition the "Gammexane" dust was applied in the following ways:—

1. In a band some 18 inches wide along the drill after the cane had germinated;
2. Broadcast over the entire drill and interspace after the cane had germinated;
3. Ploughed in before planting;
4. Disced in before planting.

Due to the great reduction in grub populations resulting from the drought and the low infestations encountered in the majority of these trials results from many plots were inconclusive, and much of this work will have to be repeated in the coming season. However, in some trials grub populations were sufficient to cause marked damage to the cane in the control plots, and in these the results of applications as low as 50 lb. of 10 per cent. "Gammexane" dust per acre were very good, although in one instance slight damage had been noticeable earlier. The 100 lb. per acre dosage, however, appeared to be a safe and effective treatment in all trials conducted this year. With regard to the time of application, treatments made prior to the beetle flights showed best results. There was some partial control when the dust was applied a month after the beetle flight, but the damage inflicted in some instances was sufficiently severe to render it a risky form of control. Treatments made two months after beetle flight were virtually useless.

In the broadcast *versus* drill applications, dosage rates lower than 100 lb. per acre were unfortunately not represented, but in any case infestation in these trials was too limited to enable definite conclusions to be drawn. This was also the case in the trials where the "Gammexane" had been incorporated in the soil by ploughing and discing. However, broadcast applications in these trials appeared to be as effective as the drill applications and provided the amount of insecticide required has not to be increased unduly over the amount found to be effective in respect of drill applications, broadcast applications may prove advantageous in killing either beetles emerging from and entering the soil or the young grubs soon after they hatch out from the eggs. Work on this important aspect of the problem is to be expanded considerably during the coming season.

So keen have Pest and Disease Control Boards become in their desire to use "Gammexane" in place of carbon disulphide for greyback grub control that it was necessary to make a recommendation as to rate of application for the coming season. This has been tentatively set down as 100 lb. of 10 per cent. dust applied as a drill dressing and worked into the soil one or two months prior to the anticipated beetle flight. At this rate, treatment costs work out at about £5 per acre as against approximately double that amount incurred in fumigating with carbon disulphide. Future experiments will most likely disclose a number of necessary refinements in rates and methods of applying "Gammexane" to different soils, but there can be no doubt that the present recommended treatment will provide effective protection for large areas.

As evidence of the popularity that "Gammexane" has already attained for grub control, more than 120 tons of the 10 per cent. dust have been ordered for application to North Queensland canefields this year, and there are reasonable prospects of this quantity being delivered. At the present recommended rate of application, this amount will treat approximately 2,700 acres. This is a greater area than was ever fumigated with carbon disulphide even when that method was at the height of its popularity. This large amount of material has been ordered at a time when the method is still in its infancy and when grubs are at the lowest ebb for many years. It seems, therefore, that very large areas are destined to be treated with "Gammexane" in future years provided its early promise of grub control is maintained.

Miscellaneous White Grub Pests.

Grubs of *Lepidiota frenchi* Blkb. again caused damage to young cane in several parts of the Northern areas, the most serious damage occurring in the Mossman district. Another species, *Lepidiota consobrina* Gir., also caused bad damage in the more clayey types of soil. On account of their two-year life cycle, the effect of drought was less marked on these pests than on *D. albohirtum*. In the Mackay area no heavy infestations of *L. frenchi* were reported, but further south in the Bundaberg district a few intense but localized attacks by grubs of

Lepidiota trichosterna Lea. occurred. In the Isis and Bundaberg districts infestations of *Pseudoholophylla furfuracea* Burm. were lighter than usual, and except in the irrigated areas losses of cane from grubs of this species were nullified by the general failure of most of these crops through drought.

Some tests with beetles of *L. frenchi* caged with "Gammexane" treated soil showed that this species in the adult stage is killed by contact with one part per million concentration of gamma isomer in the soil. Tests with grubs, however, tended to indicate that grubs of this species and of *L. consobrina* are more resistant to this insecticide than those of *D. albohirtum.*

During the past year several field trials with "Gammexane" dust were set out in the Mossman, Mulgrave, Bundaberg and Isis districts, where one or other of these two-year cycle pests is the dominant species. These trials in some degree paralleled those established against grubs of *D. albohirtum,* and in addition to row applications included blanket applications of the dust both ploughed in and disced into the top layer of soil. Partly on account of the fact that the insecticide was sometimes applied rather late, and partly on account of the prolonged dry weather, no conclusive evidence has been obtained from these experiments to date. It is planned to repeat several of the treatments during the coming spring-summer period.

The Wireworm Pest (*Lacon variabilis* Cand.).

Wireworms were present in pest proportions in some fields in the Mackay district during the year, but the damage inflicted was not extensive. Experimental work with "Gammexane" as a deterrent against these pests was continued, and a number of field trials was set out in the spring of 1946. These demonstrated that when this insecticide was mixed with the amount of fertilizer normally used on plant crops, and applied at the rate of 20 lb. per acre (10 per cent. dust, 1.3 per cent. gamma isomer) in a band just above the setts, approximately 95 per cent. protection was obtained without any appreciable root damage. Untreated control plots gave germinations seldom in excess of 10 per cent. The cost of this treatment worked out at about £1 per acre. Following the successful establishment of a larger scale field trial, plans were put in hand for the expansion of this work during the winter-spring period of 1947 and it is expected that a large number of plots well dispersed throughout the area will be set out under ordinary farm conditions. Although in some cases this involves a number of modifications or alterations to existing planting and fertilizing machines to ensure the "Gammexane"-fertilizer mixture being delivered just above the point where the soil "run-in" first contacts the setts, a large proportion of this demonstrational programme has already been completed, and it is expected that results later on will confirm last season's experimental findings.

Locusts.

The swarm phase of the yellow-winged locust, *Gastrimargus musicus* Fab., appears to be disappearing from the Mackay and Ayr districts, only a few scattered swarms having been encountered during the early part of the year. In the Mulgrave area one small focus of infestation was observed in March, 1947, when small but dense swarms of immature hoppers were seen feeding on grasses along headlands; they finally dispersed without inflicting any injury on the cane crops.

During June some areas in the Cairns district which were carrying poor crops overgrown with grass and weeds became infested with hoppers of *Locusta migratoria* L. Comprising all stages from first-stage hoppers to adults, these infestations were concentrated originally in patches some three or four acres in extent, and practically all individuals were of the gregarious phase. Later these pests spread out and eventually covered several hundred acres, stripping fields of volunteer cane and in some instances feeding on recently germinated cane. However, the damage sustained was mostly light. Towards the end of June adults of this species were noticed laying eggs along the headlands of the previously infested area, and individuals of the succeeding generation were observed to be much lighter in colour. They soon scattered over a wide area and it appeared that this generation had reverted to the solitary phase.

An area of approximately half an acre where these hoppers were very dense was dusted with "Gammexane" dust (1.5 per cent. gamma benzene hexachloride), which gave a very effective kill in a comparatively short period.

At one stage some concern was felt in South Queensland over the appearance in the Gin Gin district of small swarms of a coastal species, *Oedaleus australis* Saus., but this infestation did not progress beyond the initial outbreak.

Beetle Borer (*Rhabdoscelus obscura* Boisd.).

Once again little damage from the beetle borer was recorded, and it is doubtful whether this pest will again assume serious proportions unless green harvesting returns to favour. In view of the scarcity of labour for harvesting even burnt crops, this would appear to be an extremely remote possibility during the next few years.

Caterpillars.

An extensive outbreak of caterpillars occurred in the Ingham district during April-May, 1947. These proved to be the semi-looping caterpillars of the Noctuid moth, *Mocis frugalis* Fab., a pest which caused minor damage on the Mulgrave River flats during 1946. At Ingham a total of more than a thousand acres suffered defoliation, the greatest damage occurring in rather light crops where grass growth was thick in the interspaces. The young caterpillars hatched amongst the grass and fed there before attacking the cane leaves. Although the damage was very spectacular the actual loss in tonnage was not great. However, some trouble was experienced in getting these crops harvested during the early part of the season because of the fact that most of the foliage had been destroyed earlier, and there was very little dead trash remaining on the crop to give a satisfactory pre-harvest burn. A wide parasite complex was observed in action, and the pest was soon brought under effective control. The parasites which were observed to be operating there were similar to those bred out from the 1946 outbreak at Gordonvale; they are referred to below. In addition, the Sphegid wasp, *Sphex clavus* Sm. E., was seen carrying caterpillars away and a Pentatomid bug, *Austromalya soueti* Dist., was another observed predator.

Army worms were responsible for little damage during the 1947 period.

Termites.

Damage to cane by the termite, *Coptotermes acinaciformis* Frogg., was reported from several parts of the north, although only in one instance, at Mossman, was the damage of more than negligible proportions. In this case the termites completely tunnelled out sticks of growing P.O.J.2878 in different parts of the field, and in this respect the damage resembled that normally caused by *Mastotermes darwiniensis* Frogg. in the Ayr district. Considerable damage to isolation plots was caused by the termite, *Hamitermes obtusidens* Mjöberg, whilst *Rhinotermes* (*Schedorhinotermes*) *intermedius seclusus* Hill was responsible for slight damage to cane plants at Aloomba.

Mites.

The sugar cane leaf mite, *Tetranychus* sp., was more in evidence during the summer of 1946 than usual, this being due to the dry season experienced. The characteristic leaf markings were particularly noticeable in the variety Trojan which appeared to be favoured by the mites.

Identification of Insects.

The species of moth referred to in the 1946 Annual Report as *Mocis trifasciata* Steph. was identified by the Imperial Institute of Entomology as *Mocis frugalis* Fab., whilst the parasites bred from the species were identified as *Actia nigritula* Mall., *Tricholyga sorbillans* Wied., *Carcelia* (*Senometopia*) *Kockiana* Tns. (Tachinidae), *Sarcophaga peregrina* R-D. (Calliphoridae), *Brachymeria* sp. (Chalcididae), *Henicospilus* sp. and *Lissopimpla semipunctata* K. (Ichneumonidae).

Wallabies.

During the dry spring and early summer of 1946 wallabies were much more prevalent than usual. They caused considerable concern in some of the broken and marginal areas of the Mackay district, where £913 was disbursed in bonuses for their scalps. In the Burdekin area they were responsible for damage to irrigated cane on farms adjacent to grazing properties, and in this district some growers utilised beagle hounds in conjunction with other farm dogs for destroying these animals or keeping them on the move. In the Far Northern areas also, extensive damage was caused to young cane, and in some instances these pests turned their attention to well-grown crops. In one area some success was claimed for poisoning with strychnine, native figs being used as a bait; but in order to provide a greater inducement for the destruction of these marsupials some Boards made a substantial increase in the amount of bonus paid per scalp. However, wire netting is considered to be one of the most effective means of guaranteeing reasonable security from wallabies, and since this material is no longer under Government control representations were made to the manufacturers' agents to grant some measure of priority in the sale of this product to growers who are affected by these pests.

Rats.

Under the harsh conditions prevailing for most of the year rat populations were so scattered that attack on cane was negligible throughout most canegrowing areas, although towards the end of June, 1947, some damage commenced to appear in those areas that had received good rains. Efforts to trap any appreciable numbers for experimental work proved abortive and research on this subject was particularly difficult.

Amongst the investigations carried out with poisons, experimental work with "ANTU" against *Rattus conatus* Thomas showed that this compound was not readily accepted even when incorporated in the normal bait base, nor was it sufficiently toxic for use as a rat poison in canefields. On the other hand, one of the newer rodenticides, sodium fluoracetate ("1080"), is readily eaten, its toxicity is particularly high, and its lethal effect very rapid. The extremely dangerous nature of this chemical, however, would limit its use to Pest Boards and other responsible organizations, and at the present time it would appear inadvisable to make this poison available to the general public. Until now, work on this poison has been restricted because of the difficulty of obtaining supplies, but a quantity recently received from America should permit further experimentation. The first post-war importation of thallous sulphate for the manufacture of rat baits came to hand recently, but it is doubtful whether the thallous packetted bait will regain its former popularity in veiw of the fact that a steep rise in the cost of the different ingredients has resulted in present quotations being almost double the pre-war figure.

Pigs.

Throughout the war years wild pigs were allowed to breed in the scrubs practically unmolested, and their numbers have still not been reduced to the pre-war level. During the past dry season many moved into the cane areas causing extensive damage. Some Boards attempted to overcome the problem by increasing the amount of bonus paid per scalp, but these animals are not concentrated in sufficient numbers to make their hunting a lucrative pursuit and it seems inevitable that a certain amount of damage will continue until it is possible to net the fields adjoining the scrub country.

Bird Pests.

Sporadic damage to cane was caused in parts of North Queensland by bald coots or red bill, *Porphyrio melanotus.* Whilst damage by these pests is normally confined to varieties with a soft rind even varieties such as Q.44 and Trojan with harder rinds were attacked in swampy land this year. In the Mossman area, white or sulphur-crested cockatoos, *Kakatoe galerita,* which in the first place were found attacking the nuts of nut grass, later turned their attention to young plant and ratoon cane, and were responsible for sufficient damage to warrant the Mossman Cane Pest and Disease Control Board paying a bonus for each bird destroyed. This form of attack by cockatoos is somewhat unusual, since former records of damage usually involved the mature stick.

Gumming Disease (*Bacterium vasculorum* (Cobb) Grieg-Smith).

For the second year in succession, gumming disease was recorded in Queensland commercial crops in the one mill area only. This was at Mossman, where the major variety concerned was S.J.4, a very important cane in that area. It was forecast in this Report for last year that it would prove impossible to confine the disease whilst such a large area of susceptible canes continued to be grown. This has proved to be the case, and two fresh centres of gumming infection were found during the year. They were on adjoining farms south of the Mossman River, and approximately three miles from the nearest known diseased fields. The method of spread in these particular instances is not known for certain, although it is thought that the disease did not come in plants brought onto these farms. The new infections were well outside the quarantine area as defined by the proclamation issued in February, 1946; accordingly the original quarantine area was enlarged this year to include the new outbreaks, plus a buffer area of clean farms. This extension of the quarantine means that approximately two-thirds of the farms and three-quarters of the acreage of cane in the district are now quarantined; Cassowary and Mowbray are practically the only localities where the susceptible varieties S.J.4 and H.Q.426 can be planted.

The usual routine gumming-disease resistance trial conducted in the Pathology Plot at Brisbane included seedlings from the Northern and Central Experiment Stations, together with the standard canes, H.Q.426 and M.1900S., for comparison. There were no seedlings from the Southern Experiment Station for test owing to the severe drought experienced in that area last year.

Downy Mildew (*Sclerospora sacchari* T. Miy.).

There were no reports of downy mildew disease in the Mossman area during the past twelve months, although two fields of S.J.4 from which diseased stools had been rogued last year were still growing. These crops are to be ploughed out after this harvest, and it is to be hoped that their destruction will mean the end of the disease in the district. Conditions for the spread of the disease were not favourable during the past year owing to the general dryness and the shortness of the wet season, and it is possible that there was no unobserved spread into the fields bordering the diseased blocks.

Bundaberg was the only district in which downy mildew disease was found during the year, and there the inspection of 16,536 acres revealed 1,936 diseased stools. One block (of 7.5 acres) was heavily infected with over 600 diseased stools, but the majority of the other diseased blocks were only lightly infected. The total of diseased stools found compares very favourably with the 1945-46 period, when unusual conditions led to a sudden development of disease, but it is more than that for 1944-45; this figure is probably round about the number to be expected in an average season, with present varieties and present methods of control. Roguing by trained gangs appears to be the most suitable method of control and is preferable to the sudden loss of the valuable, although susceptible, P.O.J.2878, but it is expected that the amount of disease will decrease appreciably only when that variety is replaced by the newer, more resistant canes.

As usual, two downy-mildew resistance trials were conducted, one in an isolated area near Cairns, and the other on the Elliott River near Bundaberg. The trial in North Queensland suffered severely from the prolonged drought, and growth was so patchy that no indications of susceptibility or resistance were obtained for any varieties. Arrangements have been made to retest the promising seedlings in the trial during the coming season. The trial at Bundaberg also suffered from the adverse seasonal condition, but the damage was not as severe as at Cairns. However, the succulent growth and steamy conditions needed for the natural spread of the disease were lacking and little disease developed in the plots of the standard canes. The trial included Station seedlings, but no named canes, apart from varieties of known commercial behaviour to the disease, and the only conclusion of interest was that one seedling was much more susceptible than P.O.J.2878, and would have to be discarded on that account. It will be necessary to retest the other seedlings.

Fiji Disease.

In the Bundaberg district the 2,288 Fiji diseased stools found in the 16,536 acres inspected by the roguing gangs of the Bundaberg Cane Pest and Disease Control Board represented a substantial decrease in comparison with previous years. Seasonal conditions, such as the severe drought and frosts of last year, undoubtedly contributed to the improvement in the disease position, but the much larger plantings of resistant varieties and the disappearance of susceptible canes from the quarantine areas at Tantitha and Avondale have also helped. The quarantine areas were previously badly infected, but the growing of C.P.29/116, Atlas, Q.28, Q.42, Q.47 and Q.49 instead of P.O.J.2878 and Q.25, has reduced the disease in these localities. During the year just past, 375 acres of cane have been inspected at Tantitha and only 26 diseased stools found; at Avondale the corresponding figures were 878 and 108. The two areas combined yielded 134 diseased stools, although as recently as 1943-44 they showed over 4,000, which then represented 69 per cent. of all diseased stools found in the district. Bingera Plantation, which is irrigated and so produces a succession of lushly grown crops ideal for the spread of Fiji disease, has shown a marked increase in the amount of disease and unfortunately unsafe blocks have had to be used for plants on both the Plantation and small farms. Even the commercially resistant Q.49 has shown the disease there, and plantings of 431 acres taken from one block of this variety resulted in slightly diseased blocks on six farms. Fiji disease was found as a new record on seven farms, one each at Lover's Walk, Oakwood, Sharon and South Kolan, and three at Miara. Two of the farms were adjacent to existing disease and two obtained plants from Bingera Plantation, but the three at Miara were in a previously clean, isolated locality and the source of infection has not been traced.

No Fiji disease was reported from the Isis area during the period under review, although periodical inspections were made. The disease occurred in the area last year and its eradication cannot be claimed until the district has been free for some years. The severe drought was an important agent contributing to the lack of disease, since it resulted in the almost total absence of succulent cane and the ploughing out of large areas of dead or dying crops.

In the Maryborough area five farms were found diseased and 29 stools were rogued. Twenty-three of these stools occurred in small blocks of M.1900S. at Tinana and Walker's Point, and the infected fields have since been ploughed out. Two of the other diseased farms were at Dundowran and one at Urraween, with P.O.J.2878 the affected variety in each instance.

Fiji disease remains a serious problem in the Moreton area, where 10,721 diseased stools were rogued during the year. A total of 272 farms was inspected and 155 were found to be diseased. The Moreton area is very difficult from the disease control point of view, since the areas of good soil produce succulent crops every year, and wet weather interferes seriously with the inspection of the growing crops at the most suitable stage. In addition, frost damage was so severe and widespread there during the winter of 1946 that many healthy crops were too badly damaged to be used for spring plantings. Consequently, in some cases there was no alternative but to take plants from doubtful sources, thus further complicating the problem of control. The Cane Pest and Disease Control Board employed eight men together with a

supervisor during the peak period of inspections, and their more intensive roguing campaign, supplemented by the issue of harvest and plough-out orders by the Bureau and the extension of the more resistant varieties such as Vesta, Q.28, Q.47, and Q.49, should give some measure of control in the next few years.

The Rocky Point Cane Pest and Disease Control Board was constituted last spring, but the crops in this mill area were generally well advanced before the supervisor was appointed and inspections were necessarily limited. However, several foci of infection were found and attended to, and some reasonably safe sources of plants were established.

It has been mentioned in previous reports that the Fiji-disease resistance trials conducted by the Bureau are carried out on alluvial soil near Beenleigh, some 22 miles south of Brisbane. The usual practice is to ratoon the crop at twelve months and rely on counts in the first ratoons to give a measure of the reactions of the varieties. On occasions, however, growing conditions are such that the trials have to be carried forward to the second ratoons and it so happened that in February, 1947, the Bureau trial plot contained a second ratoon crop, a first ratoon crop and a young plant crop put in early last spring. Results would have been obtained, and the first two trials finalized, by June, 1947, but, unfortunately, a severe flood, the worst in the area since 1887, covered all these trials with several feet of silt and sand, and they were lost. Many seedlings and named canes from both Bureau and outside sources were included in these trials and the evaluation of their disease resistance must await results from the trial just planted. This was made as large as possible, in a situation above known flood-level, but even so all canes could not be fitted into the available area and several will have to wait until next year.

Leaf Scald (*Bacterium albilineans* Ashby).

This disease appears to be moving out of the category of a minor, only potentially important disease, into that of a major trouble in North Queensland. This is largely due to the fact that some of the newer canes, particularly Q.44 and Trojan, are showing a good deal of susceptibility in commercial plantings. In the Mossman district about 50 acres are infected with the disease, both Q.44 and S.J.4 showing infection. At Hambledon, Q.44 and Trojan appear to be clean except for two blocks of Q.44 at Freshwater, but in the same locality Comus and Pompey have shown some disease. It is probable that many fields of Trojan on rich flats at the northern end of the Hambledon area may show the disease when the young ratoons are inspected; the heavy plant crops growing at present are impossible to inspect. One of the worst areas for leaf scald occurs amongst the wet, badly-drained fields at the northern end of the Mulgrave area, and it is there that Q.44 is showing a great deal of infection, with fields of Trojan also often infected. It appears that the spread of the disease here is too rapid to allow of control by roguing and selection of sources of plants and, if Q.44 in particular is to be saved, some effort will have to be made to organize an outside source of plants. It may be necessary to make similar arrangements for Trojan. In the Innisfail area severe leaf-scald infection showed in many fields of Q.44 and occurred in the same variety at Tully. Some fields of H.Q.426 and Badila also showed the disease but not to the same extent as Q.44. It remains to be seen whether plant selection will prevent the further spread of the disease in the new varieties and give adequate control in the Innisfail and Tully areas.

The leaf-scald disease resistance trial on an isolated farm near Gordonvale, N.Q., suffered from the dry conditions and growth in the plot was very irregular. This, combined with the fact that the susceptible Q.44 failed to develop any disease, prevented any positive conclusions being drawn in regard to the new canes under test. The susceptibility of Trojan and the persistence of symptoms in that variety were well shown. As mentioned previously in these reports, persistence of symptoms has an important bearing on the commercial reaction of a variety in that when symptoms, obvious or otherwise, persist in live stools (i.e., there is not a great deal of either death or recovery), the variety is not self-cleaning and so becomes more heavily infected as the crop cycle advances.

Chlorotic Streak.

Probably due to the light wet season chlorotic streak in the Northern mill areas was generally confined to the normally wet, low-lying fields and was not noticeable on the well-drained soils. During the year the disease was recorded for the first time at Maryborough. It was found in two small blocks of ratoon P.O.J.2878 which showed 4 to 5 per cent. of the stools infected. The very poor growth of the crops in the locality at the time prevented an investigation into the possible source of the disease. At Moreton, the disease has been seen in most of the approved varieties and also in Akbar, Q.47, Q.49, Trojan and Vesta; it is causing considerable losses in parts of the area and a trial has been planted to ascertain the effects on some of the promising new canes.

In July, 1946, Mr. R. A. Abbott, a member of the Bureau's field staff who was in the military forces at the time, positively identified chlorotic-streak disease on cane in the Gazelle Peninsula on the island of New Britain off the north-west coast of New Guinea. This appears to be the first record of the disease on that island.

A chlorotic-streak resistance trial was planted at Moreton and both there and in northern areas other types of trials have been initiated. These include yield trials and trials designed to ascertain the time of the year when transmission of the disease occurs.

With a view to facilitating field experimental work with this disease a portable hot-water treatment plant was constructed. Mounted on a two-wheel trailer it consists of a galvanized steel tank capable of holding about 200 gallons of water, which is pumped into the tank by means of a 2-inch semi-rotary pump. Heat is provided by a small stove and a system of flues under the tank, and the cane, either in bundles or bags, is lifted into the water by a crane and windlass arrangement. The tank has a capacity of six bags of setts, or their equivalent, at a time, and should be of considerable assistance in treating plants for farm trials and demonstrations.

Red Rot. (*Physalospora Tucumanensis*).

Very dry conditions during the winter and spring months in the central districts led to a good deal of red rot in certain varieties during the 1946 harvest. The variety Q.50 showed a considerable infection in some fields but Co.290 and, to a lesser extent, Q.28 also became infected. Tonnage and sugar yields were reduced, sometimes seriously, but it was found that plants showing red rot usually gave a much better strike than was expected. In the southern mill areas dry weather and frost caused many crops to become heavily infected and some were destroyed, whilst others gave such low C.C.S. figures that they were condemned by the mill.

Red rot became serious in the variety Q.52 this year, and the projected distribution of that vigorous cane has had to be postponed for at least a season while further observations are made. Q.52 showed the disease as early as April—i.e., during the growing season—and from past experience with other varieties it would appear that Q.52 is too susceptible for commercial cultivation. The early symptoms of red rot as observed in this variety in the autumn were quite different from the usual type; this normally consists of a yellowing and later withering of the top, commencing on the older leaves, with the internodes showing internally the characteristic reddening and transverse whitened areas, often with a water soaking effect in the ground tissue. There are variations in the effect on the leaves, as, for instance, the death of a single leaf which occurs sometimes in the Northern Rivers district of New South Wales; but the symptoms on Q.52 were quite unusual and have not, as far as can be ascertained, been described before. They consisted of white to pale-yellow broken streaks up to eight millimetres in width and varying from a few centimetres in length to the full length of the blade. One to many occurred on a leaf, and where the streaks were numerous a mosaic-like pattern resulted. Leaves of any age were affected and a varying number in each top. Affected shoots per stool ranged from one to every stick in the stool. As the streaks aged, necrotic areas appeared and eventually the whole streak became involved. The stem internally was healthy except for a few reddened vascular bundles and a slightly acid odour in the bottom few inches. Affected crops were well grown and gave promise of satisfactory yields, but subsequently the red rot became systemic and many dead stalks resulted.

Dwarf Disease.

A large-scale survey of the Mackay district (the only area where this disease has been recorded) was carried out by the Cane Pest and Disease Control Board at the request of the Bureau during the spring of 1946, and 2,186 diseased stools were rogued. They were spread over 245 acres comprising 65 fields on 29 farms. The variety chiefly affected was P.O.J.2878, followed by H.Q.426, E.K.28, and Q.45. New records were one farm at Calen, two farms adjacent to the known dwarf area and one farm at Walkerston. Comus was the only new variety recorded.

During the late summer months of this year several plots attempting mechanical and insect transmission of the disease were set out.

Top Rot (*Phytomonas rubrilineans* Lee *et al.*).

Top rot and red stripe were present, but not causing appreciable losses, in the northern areas. It was observed that the red-stripe stage was usually absent from the variety Trojan, and early symptoms consisted of a general unthrifty appearance of the whole top, with the young leaf sheaths assuming a purplish tinge; death of all leaves was coincidental with the death of the heart, and the development of the characteristic top-rot odour. Early in 1947 red stripe became prevalent in the Bundaberg area, chiefly in P.O.J.2878 and Q.49, but there was little development into the top-rot stage.

Mosaic.

Mosaic disease occurs in the Burdekin area in small amounts; at Mackay it is still present but, with the replacement of susceptible varieties in river and creek-bank fields by P.O.J.2878, and on clay-bottomed lands by Q.28 and, to a lesser extent, P.O.J.2878, the area infected with this disease has declined considerably. In the South it occurs chiefly in Q.25 and Q.42 with some infection in Q.49, although in the Moreton area several other varieties are also affected.

Miscellaneous.

In December, 1946, field officers in the Burdekin area reported the presence of a few stools of cane affected with a disease which they were not able to identify. A Bureau pathologist found that the disease was confined to the locality known as Down River in the Inkerman Mill area, and occurred in Badila, B.208 and H.Q.426. Symptoms consisted chiefly of a flecking of the leaves with a scorching of the leaf edges and tips, and a tendency for the affected blades to arch over towards the spindle. A varying number of shoots per stool was affected, and the diseased shoots were smaller than the healthy. Losses were negligible, but the affected areas are being kept under close observation.

The trouble with the variety Q.28 in the Mackay district, in which some sources of plants give rise to very poor ratoons, was mentioned in this report for 1945. It has since been found to be very prevalent in most parts of the district, and is causing serious losses judging by other ratoon crops produced, often in the same paddock, by plants from "reliable" sources. A district-wide survey has been undertaken and detailed investigations are proceeding in an attempt to trace the cause of the poor growth.

In the Moreton mill area several interesting pathological items have been recorded during the past year. Several blocks of well-grown crops showed a rot extending into several nodes midway up the stick following fairly severe frosts. Investigation showed that infection had occurred through the frost-killed eyes and then spread through the tissues of the node. The causal agent of rind diseases (*Pleocyta sacchari* (Mas.) Petr. and Syd.) was present in many instances. A similar infection occurred in the Bundaberg district, but in smaller amounts. At Moreton, an infection caused by what appeared to be a species of *Sclerospora* was found in regrowth P.O.J.2878 following flood damage. This disease has occurred previously in Bundaberg and the Northern Rivers district of New South Wales, but has not needed any control measures on a large scale. The symptoms could be confused with those of dwarf disease at certain stages of growth. The third disease at Moreton has been provisionally named "droopy top" owing to the characteristic droop of the leafy top of the plant. It occurs markedly in patches on light sandy soils, and when severe has caused some losses. It has not been transmitted from plant to plant, and appears to be due to some soil deficiency. There is some indication that copper and/or zinc might remedy the trouble.

Red rot of the leaf sheaf, due to *Sclerotium rolfsii* Kruger, was common in the northern mill areas when the first rains of the wet season started the canes into succulent growth. Frequently in the variety Trojan the fungus grew through the leaf sheath and into the rind of the young internodes resulting in shallow cankers on the stem. Although the damage was spectacular, the canes were sound and normal inside. An unidentified fungus was responsible for banded lesions on the leaves of Trojan and Q.28 and several other varieties in northern mill areas.

Attention has been given in recent years to the question of stimulating the germination of cane, particularly when for some reason or other it has to be planted under unfavourable conditions. Experiments conducted during the past year have shown that soaking of the plants in certain mercurial preparations gives a marked response in increased speed of germination. Overnight soaking, however, is expensive and would involve a considerable amount of equipment for the average farm, and it is fortunate that a dip of a few minutes in a stronger solution appears to give some stimulation, as well as protection against such sett parasites as the causal agent of pineapple disease (*Thielaviopsis paradoxa* (de Seynes) v. Hohn). Large-scale experiments which should yield results on a harvestable scale are now under way and in commercial plantings two farmers on the Burdekin have planted over 40 acres with treated cane. In contradistinction to South African findings, it was found that dipping the ends of the setts in a mercurial dust was not beneficial during hot, dry weather, although it is possible that the mercury content of the dust (3·0 per cent.) may have been too high and caused some injury to the setts.

New varieties which came through the quarantine house during the year and are now being distributed to the sugar areas, included one cane from New Britain (the others either did not survive, or had to be destroyed on account of primary Fiji disease), N.Co.310 from South Africa, and six C.P. canes, 29-320, 34-79, 34-120, 36-13, 36-62, 36-105, from the United States of America. It is expected that further varieties from South Africa, as well as canes from India, New South Wales and Mauritius, will be received in the near future. Setts of various Queensland varieties have been sent to the United States, Mauritius, South Africa, the Philippines and Egypt.

Publications.

Officers of this Division play an important part in the activities of the Agricultural Section of the Queensland Society of Sugar Cane Technologists, and the following papers were submitted to the 1947 Conference held in Innisfail from 30th April to 7th May:—

"Notes on Termites which damage sugar-cane in North Queensland," by J. H. Buzacott.

"The symptoms of leaf-scald disease in sugar-cane," by C. G. Hughes.

"The varietal revolution in the Ingham district," by C. G. Hughes.

Division of Mill Technology.

By J. L. Clayton, Mill Technologist.

Staff.

Since the presentation of the previous Annual Report Mr. J. H. Nicklin's classification has been raised to that of Senior Technologist. Mr. A. H. Praeger, who was seconded from the Bureau to the Flax Production Committee, has accepted the position of Chief Engineer with the Committee and resigned from the Bureau. Mr. L. R. Brain has taken up duties with the Bureau following the successful completion of his University Course and Mr. B. G. Adkins, also a recent graduate in Applied Science, has been appointed to the Technology staff. Mr. D. L. McBryde, formerly officer in charge of Central Sugar Experiment Station, has been transferred to the Technology division, Brisbane.

Mutual Control.

For the first time for some years mill figures were received and distributed fortnightly during the 1946 season. One of the 24 mills in the Mutual Control scheme was not able to contribute fortnightly figures, but provided over-all seasonal figures for the annual Synopsis.

Standardization of Apparatus.

The results of the tests conducted were as follows:—

Brix Spindles.—Of 478 spindles tested 340 were granted official certificates. Of the remaining 138, which received unofficial certificates, all had errors beyond the legal tolerance and 20 were of unofficial range.

Polariscope Tubes.—All of the 17 tubes tested were found satisfactory.

Polariscopes.—Two polariscopes were overhauled.

Weights.—Three boxes of weights were tested on behalf of mills, and certificates issued.

Mill Work.

In accordance with the decision of the Mill Research Programme Committee, which met in April, 1946, tests were conducted at Mulgrave Mill during the 1946 season to determine the influence of time of contact between bagasse and maceration water upon milling efficiency. Within the range of times obtainable in the tests the practical benefits of increased time of contact were negligible, though there was a significant correlation between time of contact and maceration efficiency.

These tests revealed the inadequacy of the existing Technology staff to deal with full scale mill investigations, and it was decided not to persevere with the items in the remainder of the research programme.

Several mills contributed data on the deterioration of juice in subsiders, but the total of the information was insufficient to enable any cause or cure to be determined.

All mills were visited during the season.

News Letter.

Three further numbers of the News Letters were published during the year. As opportunity offers the frequency of publication of this journal will be increased by several issues per year.

Conference Papers.

The officers of the Technology division assisted in the organization of the Conference of the Queensland Society of the Sugar Cane Technologists held at Innisfail in 1947, and contributed papers to the proceedings as follows:—

Mr. E. R. Behne.—"Low Grade Massecuite Treatment."

Mr. J. H. Nicklin.—"Storage Battery Locomotives."

Mr. J. L. Clayton.—Low Grade Fugal Performance."

Mr. C. B. Venton.—"The Drying of Raw Sugar."

The 1946 Season.

Production Data.—The production data for the 1946 season are set out in Table X. The four sections of this table have been extended to include the pol quantities in sugar, mud, molasses, final bagasse and undetermined loss as percentages of the pol in the cane. However, it must be understood that these recoveries and losses do not constitute an index to individual mill performance.

It has already been pointed out in the Director's Report that the quality of the cane crushed in 1946 was below normal and that this resulted in a reduced yield of sugar per ton of cane. Reference to Table X shows that in the Northern district the quality of the cane was practically normal according to the analytical results but yielded more molasses and less sugar than would have been expected by comparison with previous seasons. It is felt that this is closely associated with the condition in which the cane was harvested and delivered to the mills. In both Central and Southern districts the quality of the cane was far below normal, and as a result the recovery of sugar fell and the loss of sugar in molasses rose substantially. The production of molasses in the Central district—11,146,914 gallons—was abnormally high and the equipment of the mills in that district was severely overtaxed. Most of these mills have now placed orders for more extensive and elaborate plant for that section of the factory in which the low grade material is treated.

Actually the high yield of molasses caused concern in all districts. Despite a crop of cane far smaller than in 1944 or 1945, the production of molasses exceeded that of 1944 or 1945 by over two million gallons. This is mainly a seasonal factor, but may also be influenced by the varieties of cane introduced in recent years and the state of the cane at the time of its crushing.

Mill Data.—Totals and arithmetic averages of mill figures are set out in Table XIII. These serve to focus attention upon the extremely adverse conditions of sugar manufacture in the Southern district. The mills there required an average of 9.10 tons of cane per ton of sugar; but this is hardly surprising when it is noted that the average purity of the first expressed juice was 80.25, and that of the clarified juice 79.18. These figures would normally approach a value of 90. This difference may not appear serious unless it is realized that of two juices, one having a purity of 90 and the other a purity of 80, and both having equal brixes, the former contains *over twice as much sugar per unit* impurity content as the latter. When recoverable sugar is considered the ratio is even more adverse. Even with the purity of 83.43 for the clarified juice in the Central district the possible yield of sugar per unit of impurity was less than two-thirds of that available from clarified juice of the normal 88-89 purity.

Just as the yield of sugar is substantially reduced by a fall in the purity of the raw material so the yield of molasses is increased. The Southern mills produced 8·05 gallons of molasses and the Central mills 6·57 gallons per ton of cane. Fortunately in these areas the molasses responded favourably to treatment and was passed out at a true purity below 46, which shows an improvement upon recent past performances. The true purity of 49.04 for final molasses in the Northern district represents a decline in factory efficiency and points to the need for more modern and more extensive low grade treatment plant in many Northern mills.

The figures for the 1946 season demonstrate clearly the unpredictable nature of raw material in the sugar factory. It might be expected that raw material of very poor quality would be most difficult to treat, and that material rich in sugar would respond favourably. In this case the reverse appears to be true. In the Northern district the purity of the clarified juice was slightly higher than in 1945, yet the recovery fell and the boiling-house efficiency and coefficient of work were lower. The molasses loss rose from 5.46 to 5.69.

On the other hand, in the South, where the quality of the juice was far inferior to that of 1945, the boiling house efficiency and coefficient of work rose, and the purity of the final molasses was below that of 1945. Similarly in the Central district the poorer material was treated more efficiently than in 1945. These comparisons may be studied in Table XIV.

Reverting to the figures in Table XIII it is noted that there was no substantial alteration in crushing rates, but lost time was reduced appreciably in the Northern and Central districts and rose in the South. The reduced extraction fell slightly in the Northern and Central districts. In the latter district this was due partly to a decrease in maceration.

In all districts substantial quantities of added fuel were used, but for the most part this was to compensate for a smaller quantity of heat available from the bagasse, and the total consumption of fuel was similar to that of 1945—expressed as equivalent bagasse per ton of cane. On the basis of sugar manufactured the fuel consumption rose. A more extensive survey of fuel consumption is given in Table XIX. It will be noted that the use of molasses as a fuel was further diminished in 1946 despite the production of a quantity far in excess of previous years. This gives some indication of the demand for molasses as a market commodity.

Reviewing the results of the 1946 season it is clear that there is very little relationship between the quality of cane as determined by analysis and the standard of efficiency attained by the mills in treating such cane. On the other hand, factory performance has become so consistent that the recovery and yield figures are now dependent almost entirely upon the quality of the cane, and significant improvements in these figures may be achieved only as raw material of higher quality is made available to the mills.

TABLE X.—PRODUCTION DATA FOR THE QUEENSLAND SUGAR INDUSTRY FOR THE SEASONS 1940 TO 1946, INCLUSIVE. (TOTALS AND WEIGHTED AVERAGES.)

NORTHERN DISTRICT.*

——	1940.	1941.	1942.	1943.	1944.	1945.	1946.
Cane—							
Tons	2,072,079	2,062,518	1,963,175	1,430,006	1,819,552	1,943,613	1,551,959
Pol per cent.	16·26	16·27	15·06	16·10	15·69	15·56	16·68
Fibre per cent.	9·89	9·71	9·89	10·62	10·39	10·51	10·57
C.C.S.	15·18	15·21	13·93	14·99	14·64	14·47	15·54
Purity first expressed juice	90·45	90·01	89·00	89·95	90·38	89·75	90·08
Sugar—							
Tons (94 net titre)	309,437	305,819	263,908	206,634	259,573	281,998	233,732
Cane per ton sugar	6·70	6·74	7·44	6·92	7·01	6·89	6·64
Pol per cent.	98·46	98·46	98·59	98·58	98·67	98·59	98·70
Net titre	96·67	96·91	97·20	97·14	97·42	97·26	97·45
Dilution indicator	34·94	34·62	33·81	32·31	28·50	31·44	28·90
Pol per cent. pol cane	87·73	87·23	86·43	86·07	86·49	86·72	85·65
Mud—							
Tons	41,814	40,446	34,864	23,045	32,285	31,614	26,009
Mud per cent. cane	3·34	3·23	3·01	2·58	2·98	2·93	3·04
Pol per cent.	3·72	3·67	4·32	4·08	4·75	4·57	3·80
Pol per cent. pol cane	0·76	0·73	0·86	0·65	0·90	0·86	0·69
Molasses—							
Gallons	4,527,762	4,875,551	4,816,269	3,738,134	4,174,420	4,415,061	3,979,612
Gallons per ton cane	3·62	3·89	4·16	4·19	3·86	4·09	4·66
Brix	84·07	85·40	85·05	84·91	84·71	87·14	85·92
Apparent purity	36·20	35·32	32·85	35·01	35·83	35·32	36·18
True purity	48·88	48·74	47·41	47·73	48·25	47·80	48·92
Reducing sugars	14·30	15·69	17·31	16·35	14·72	16·56	14·88
Pol per cent. pol cane	4·35	4·67	4·98	4·99	4·81	5·28	5·52
Final Bagasse—							
Tons	269,202	262,501	240,685	197,909	235,132	234,022	194,494
Bagasse per cent. cane	21·52	20·96	20·68	22·01	21·72	21·68	22·75
Pol per cent.	3·31	3·30	2·67	2·83	2·79	2·72	3·03
Dry substance	50·17	50·51	51·34	51·77	51·45	51·62	50·40
Pol per cent. pol cane	4·38	4·25	3·69	3·90	3·87	3·79	4·13
Undetermined loss—							
Pol per cent. pol cane	2·78	3·12	4·04	4·39	3·93	3·35	4·01
Fuels—							
Tons wood	8,885	8,622	8,433	6,936	6,353	11,143	10,291
Tons coal	..	..	..	..	..	..	..
Tons molasses	9,427	5,970	16,908	12,539	12,144	9,951	5,232

* The figures for tons of cane, tons of sugar, and tons of cane per ton of sugar refer to all mills. All others exclude C.S.R. Co. mills.

CENTRAL DISTRICT.†

——	1940.	1941.	1942.	1943.	1944.	1945.	1946.
Cane——							
Tons	1,891,399	1,724,922	1,631,976	1,176,802	1,700,451	1,699,803	1,716,764
Pol per cent.	16·23	15·98	16·14	16·58	16·87	15·83	15·21
Fibre per cent.	11·37	11·37	11·22	11·95	12·07	12·34	11·34
C.C.S.	15·07	14·92	15·17	15·56	15·81	14·79	13·69
Purity first expressed juice	89·61	90·40	91·40	91·19	90·98	90·48	85·64
Sugar—							
Tons (94 net titre)	280,777	256,923	240,458	177,527	262,254	242,673	227,754
Cane per ton sugar	6·74	6·71	6·79	6·63	6·48	7·00	7·54
Pol per cent.	98·43	98·71	98·74	98·80	98·91	98·93	98·87
Net titre	96·58	97·20	97·36	97·52	97·77	97·80	97·63
Dilution indicator	31·51	32·83	31·78	29·35	26·95	24·58	27·16
Pol per cent. pol cane	87·63	88·98	87·03	86·65	86·94	85·75	82·96
Mud—							
Tons	69,433	60,631	66,194	47,653	66,339	64,449	70,807
Mud per cent. cane	3·69	3·52	4·06	4·05	3·91	3·79	4·12
Pol per cent.	2·11	1·80	1·89	1·80	1·85	1·78	2·15
Pol per cent. pol cane	0·48	0·40	0·47	0·44	0·43	0·43	0·58
Molasses—							
Gallons	7,692,309	6,826,234	6,269,265	4,773,416	7,474,610	7,902,266	11,146,914
Gallons per ton cane	4·07	3·96	3·84	4·06	4·40	4·65	6·69
Brix	88·53	88·79	86·81	88·15	87·36	87·46	88·02
Apparent purity	35·20	35·21	38·10	37·11	37·36	38·99	34·44
True purity	46·25	46·24	47·00	46·40	47·20	48·71	45·68
Reducing sugars	15·70	15·22	13·02	14·68	14·34	13·54	23·81
Pol per cent. pol cane	5·12	5·09	5·12	5·24	5·55	6·54	8·44
Final bagasse—							
Tons	479,723	417,549	418,048	303,907	435,253	437,701	426,219
Bagasse per cent. cane	25·36	24·21	25·62	25·82	25·60	25·75	24·82
Pol per cent.	3·09	2·81	2·76	2·93	2·91	2·67	3·03
Dry substance	48·78	49·54	49·42	49·42	50·22	51·43	49·71
Pol per cent. pol cane	4·83	4·26	4·38	4·56	4·42	4·34	4·94
Undetermined loss—							
Pol per cent. pol cane	1·94	1·27	3·00	3·11	2·66	2·94	3·08
Fuels—							
Tons wood	8,914	6,270	6,936	10,759	11,422	7,240	15,322
Tons coal	641	250	171	559	642	514	637
Tons molasses	1,642	1,557	1,024	886	1,152	1,299	1,083

† The fuel figures exclude Pioneer and Inkerman mills. All others include all mills.

TABLE X.—*continued.*

SOUTHERN DISTRICT.

——	1940.	1941.	1942.	1943.	1944.	1945.*	1946.*†
Cane—							
Tons	1,217,278	1,006,149	755,491	790,616	878,187	908,566	445,752
Pol per cent.	15·42	14·76	14·96	14·42	15·35	14·84	13·23
Fibre per cent.	13·40	12·93	13·85	13·64	13·39	13·97	13·47
C.C.S.	14·12	13·57	13·73	13·26	14·20	13·63	11·54
Purity first expressed juice	87·69	87·94	88·01	88·18	89·15	88·17	81·18
Sugar—							
Tons (94 net tire)	169,232	134,603	101,314	102,286	121,713	119,918	50,600
Cane per ton sugar	7·19	7·48	7·46	7·73	7·22	7·58	8·81
Pol per cent.	98·53	98·80	98·86	98·90	99·08	99·09	98·72
Net titre	96·63	97·16	97·39	97·56	97·92	97·95	97·02
Dilution indicator	30·41	24·27	31·15	29·11	26·13	27·79	26·73
Pol per cent. pol cane	86·42	86·64	85·53	85·49	85·90	86·33	81·99
Mud—							
Tons	40,901	31,996	26,669	32,969	31,966	34,716	15,601
Mud per cent. cane	3·36	3·18	3·53	4·17	3·64	3·90	3·69
Pol per cent.	2·80	2·90	2·69	2·19	2·50	3·59	3·20
Pol per cent. pol cane	0·61	0·62	0·63	0·63	0·59	0·94	0·89
Molasses—							
Gallons	5,550,788	4,567,916	3,641,467	3,541,960	3,837,677	4,139,049	3,204,205
Gallons per ton cane	4·56	4·54	4·82	4·48	4·37	4·56	7·14
Brix	90·75	87·82	89·29	88·82	89·19	88·62	88·06
Apparent purity	37·42	36·77	38·39	39·71	38·72	39·15	34·60
True purity	46·05	45·96	46·32	47·38	46·98	47·20	45·04
Reducing sugars	13·05	12·70	12·06	10·06	11·21	11·08	19·59
Pol per cent. pol cane	6·66	6·49	7·27	7·20	6·47	7·13	11·04
Final bagasse—							
Tons	335,558	264,208	215,800	225,235	243,681	267,213	126,496
Bagasse per cent. cane	27·61	26·31	28·56	28·55	27·71	29·41	29·20
Pol per cent.	2·37	2·14	2·22	2·03	2·14	2·17	2·14
Dry substance	51·64	52·00	51·43	50·51	51·15	50·20	49·41
Pol per cent. pol cane	4·24	3·81	4·24	4·01	3·87	4·39	4·38
Undetermined loss—							
Pol per cent. pol cane	2·07	2·44	2·33	2·67	3·17	1·21	1·70
Fuels—							
Tons wood	10,569	8,573	7,418	15,339	11,044	10,351	9,532
Tons coal	155	158	504	1,083	602	411	1,001
Tons molasses	25	..	..	..	..	..	..

* In 1945, mud figures exclude Rocky Point and Fuel figures exclude Maryborough.

† In 1946, Mount Bauple is excluded from Mud and Fuel figures and Rocky Point from all except Tons Cane, Tons Sugar, Tons Cane per ton Sugar and Fuel figures.

ALL QUEENSLAND DISTRICTS.

——	1940.	1941.	1942.	1943.	1944.	1945.	1946.
Cane—							
Tons	5,180,756	4,793,589	4,356,642	3,397,424	4,398,196	4,551,982	3,714,475
Pol per cent.	16·02	15·75	15·51	15·80	16·15	15·51	15·33
Fibre per cent.	11·51	11·26	11·71	12·02	11·90	12·21	11·44
C.C.S.	14·87	14·64	14·43	14·72	15·07	14·41	13·89
Purity first expressed juice	89·55	89·55	89·80	89·93	90·35	89·70	86·23
Sugar—							
Tons (94 net titre)	759,446	697,345	605,680	486,447	643,540	644,661	512,086
Cane per ton sugar	6·82	6·87	7·18	6·98	6·83	7·06	7·25
Pol per cent.	98·45	98·65	98·71	98·76	98·88	98·86	98·80
Net titre	96·63	97·10	97·31	97·30	97·70	97·67	97·36
Dilution indicator	32·20	31·70	32·16	31·67	27·34	27·75	27·66
Pol per cent. pol cane	87·33	87·86	86·53	86·17	86·57	86·17	83·67
Mud—							
Tons	152,148	133,073	127,727	103,667	130,590	130,779	112,417
Mud per cent. cane	3·49	3·34	3·60	3·63	3·57	3·56	3·75
Pol per cent.	2·76	2·66	2·72	2·70	2·78	2·93	2·68
Pol per cent. pol cane	0·60	0·56	0·63	0·56	0·60	0·67	0·66
Molasses—							
Gallons	17,770,859	16,269,701	14,727,001	12,053,510	15,486,707	16,456,376	18,330,731
Gallons per ton cane	4·08	4·08	4·15	4·22	4·23	4·46	6·07
Brix	88·10	87·50	86·85	87·34	87·10	87·67	87·58
Apparent purity	36·09	35·68	36·45	37·22	37·28	38·05	34·84
True purity	46·86	46·91	46·97	47·10	47·43	48·09	46·26
Reducing sugars	14·52	14·65	14·19	13·84	13·77	13·73	21·18
Pol per cent. pol cane	5·31	5·28	5·51	5·65	5·55	6·30	7·85
Final bagasse—							
Tons	1,084,483	944,258	874,553	727,051	914,066	938,936	747,209
Bagasse per cent. cane	24·88	23·71	24·67	25·43	24·97	25·46	24·86
Pol per cent.	2·95	2·80	2·62	2·67	2·75	2·54	2·87
Dry substance	49·98	50·45	50·46	50·57	50·80	51·13	49·86
Pol per cent. pol cane	4·54	4·15	4·13	4·21	4·13	4·17	4·62
Undetermined loss—							
Pol per cent. pol cane	2·22	2·15	3·20	3·41	3·15	2·69	3·20
Fuels—							
Tons wood	28,368	23,465	22,787	33,034	28,819	28,734	35,145
Tons coal	796	408	741	1,642	1,244	925	1,638
Tons molasses	11,094	7,527	17,932	13,425	13,296	11,250	6,315

Tons of Cane, Tons Sugar, and Tons Cane per ton Sugar include all mills. All other figures exclude C.S.R. Mills only, except—

(1) In 1945, Mud figures exclude Rocky Point and Fuel figures exclude Maryborough.

(2) In 1946, Mount Bauple is excluded from Mud and Fuel figures and Rocky Point from all except Tons Cane, Sugar, Tons Cane per ton Sugar and Fuel figures.

(3) All years Fuel figures exclude Pioneer and Inkerman.

TABLE XI.—SUGAR PRODUCED 1946, COMPARED IN DISTRICTS WITH AGGREGATE PEAK ALLOCATIONS. (IN TONS OF 94 N.T. SUGAR).

District.	Tons 94 n.t. Sugar.			Production Per Cent. Peak.
	Produced.*	Peak.	Excess of Peak Over Production.	
Northern	233,725	330,000	96,275	70·83
Central	227,718	270,000	42,282	84·34
Southern	50,592	137,000	86,408	36·93
Totals	512,035	737,000	224,965	69·48

* Exclusive of local sales (51 tons).

TABLE XII.—TONS OF CANE PER TON 94 N.T. SUGAR (WEIGHTED AVERAGE).

1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.
6·90	7·31	6·97	6·92	6·94	6·73	6·87	6·77	6·82	6·87	7·18	6·98	6·83	7·06	7·25

TABLE XIII.—FIGURES FOR 1946 SEASON. (TOTALS AND ARITHMETIC AVERAGES).

Districts.	Northern.	Central.	Southern.	All Districts.
Tons cane crushed	1,551,959	1,716,764	445,752	3,714,475
Tons sugar made (94 n.t.)*	233,732	227,754	50,600	512,086
Net titre	97·31	97·61	97·14	97·40
Tons cane per ton 94 n.t. sugar	6·71	7·64	9·10	7·76
C.C.S. in cane	15·50	13·63	11·45	13·39
Coefficient of work	96·16	96·74	97·83	96·84
Coefficient of work E.S.G.	91·27	91·75	92·93	91·89
Crushing rate	74·58	61·55	45·06	59·48
Lost time, per cent.	7·36	6·21	9·28	8·09
Fibre, per cent. cane	10·51	11·37	13·49	11·83
Pol per cent. cane	16·65	15·17	13·22	14·91
First expressed juice—				
Brix	21·91	21·19	20·26	21·07
Purity	89·96	85·07	80·25	84·71
Clarified juice—				
Brix	16·96	16·02	15·11	15·95
Purity	89·65	83·43	79·18	83·57
Syrup—				
Brix	69·76	70·24	67·65	69·26
Purity	89·30	83·58	79·30	83·58
Last expressed juice—				
Purity	76·93	75·40	70·20	74·15
Clarified juice per cent. cane	104·25	106·17	105·53	105·48
Dilution per cent. first expressed juice	29·25	33·54	34·78	32·88
Final bagasse—				
Pol	3·03	3·11	2·10	2·78
Dry substance	50·39	49·37	50·03	49·85
Pol extraction	95·91	94·83	95·60	95·31
Reduced extraction	95·01	94·26	96·03	94·93
Final molasses—				
Gallons per ton cane	4·67	6·57	8·05	6·59
Brix	85·93	87·86	85·89	86·81
Apparent purity	36·36	34·53	35·35	35·20
True purity	49·04	45·67	45·58	46·42
Reducing sugars	14·78	23·14	19·73	20·17
Final mud—				
Tons per cent. cane	3·04	3·82	3·52	3·55
Pol per cent.	4·23	2·77	3·71	3·38
Sugar—				
Pol	98·668	98·846	98·574	98·721
Reducing sugars	·361	·352	·404	·370
Ash	·199	·177	·231	·198
Moisture	·319	·248	·327	·289
Dilution indicator	31·42	27·57	27·89	28·56
Pol balance—				
Sugar (recovery)	85·32	82·63	80·69	82·57
Bagasse	4·09	5·17	4·40	4·69
Molasses	5·69	8·74	12·05	8·93
Mud	·71	·55	·87	·68
Undetermined	4·19	2·91	1·99	3·13
Boiling house efficiency	93·10	93·72	93·18	93·42
Boiling house efficiency E.S.G.	92·72	93·37	92·81	93·05
Fuels (calculated as equivalent bagasse per cent. cane)—				
Wood	2·287	2·730	5·693	3·516
Coal	·000	·132	·697	·270
Molasses	1·088	·132	·000	·341
Total added	3·375	2·994	6·390	4·127
Bagasse	22·858	25·183	29·341	25·842
Total fuel	26·233	28·177	35·731	29·969
Crop days	1,447	1,591	702	3,740

* Local sugar sales included.

TABLE XIV.—AVERAGE PERFORMANCE DATA FOR QUEENSLAND SUGAR FACTORIES, EXCLUDING COLONIAL SUGAR REFINING CO'S. FACTORIES (ARITHMETIC AVERAGES.)

—	Northern District.		Central District.		Southern District.		All Queensland Districts.	
	1945.	1946.	1945.	1946.	1945.	1946.	1945.	1946.
Pol in cane	15·53	16·65	15·74	15·17	14·89	13·22	15·41	14·91
Fibre in cane	10·55	10·51	12·54	11·37	14·21	13·49	12·66	11·83
Purities—								
First expressed juice	89·62	89·96	90·36	85·07	88·37	80·25	89·53	84·71
Clarified juice	89·62	89·65	88·73	83·43	87·45	79·18	88·50	83·57
Syrup	89·38	89·30	88·96	83·58	87·60	79·30	88·60	83·58
Gallons molasses per ton cane	4·12	4·67	4·83	6·57	4·75	8·05	4·65	6·59
Apparent purity final molasses	35·44	36·36	38·66	34·53	40·17	35·35	38·45	35·20
Overall recovery	86·79	85·32	84·93	82·63	82·97	80·69	84·69	82·57
Overall recovery E.S.G.	86·41	84·97	84·62	82·33	82·73	80·34	84·39	82·24
Recovery on mixed juice	90·26	88·96	89·07	87·13	87·04	84·52	88·66	86·67
Recovery on mixed juice E.S.G.	89·87	88·60	88·75	86·81	86·78	84·15	88·34	86·31
Boiling house efficiency	94·88	93·10	93·04	93·72	91·77	93·18	93·04	93·42
Boiling house efficiency E.S.G.	94·48	92·72	92·71	93·37	91·50	92·81	92·71	93·05
Pol extraction	96·15	95·91	95·33	94·83	95·32	95·60	95·51	95·31
Reduced extraction	95·34	95·01	95·33	94·26	95·99	96·03	95·56	94·93
C.C.S. in cane	14·43	15·50	14·69	13·63	13·70	11·45	14·30	13·39
Coefficient of work	98·06	96·16	95·68	96·74	94·83	97·83	95·93	96·84
Coefficient of work E.S.G.	93·05	91·27	90·69	91·75	89·94	92·93	90·96	91·89

TABLE XV.—CANE MILLED AND SUGAR YIELD, SEASON 1946.

—	Tons Cane Crushed.	Tons 94 n.t. Sugar Made.	Tons Cane per Ton 94 n.t. Sugar.	
			1946.	1945.
Mossman	102,050	14,795	6·898	6·980
Hambledon	112,960	16,014	7·014	6·748
Mulgrave	136,140	18,252	7·459	7·067
Babinda	158,156	23,681	6·679	7·311
Goondi	119,633	17,908	6·680	7·198
South Johnstone	166,193	26,069	6·375	7·012
Mourilyan	108,368	16,263	6·663	7·240
Tully	183,788	29,221	6·290	6·836
Macknade	238,791	36,935	6·465	6·614
Victoria	225,880	34,497	6·548	6·481
Local sales	..	7	..	..
Totals and averages, Northern District	1,551,959	233,732	6·640	6·892
Invicta	84,137	13,082	6·432	6·331
Pioneer	174,705	25,586	6·828	6·294
Kalamia	187,267	27,346	6·848	6·338
Inkerman	210,881	28,686	7·351	6·486
Proserpine	98,188	12,668	7·751	6·716
Farleigh	163,807	21,368	7·666	7·851
Racecourse	179,544	21,923	8·190	8·133
Pleystowe	169,940	22,383	7·592	7·570
Marian	137,132	17,768	7·718	7·272
Cattle Creek	64,093	7,917	8·096	7·122
North Eton	90,288	10,298	8·768	8·272
Plane Creek	156,782	18,693	8·387	7·692
Local sales	..	36	..	..
Totals and averages, Central District	1,716,764	227,754	7·538	7·004
Bingera	99,316	11,993	8·281	7·431
Fairymead	65,594	7,254	9·042	7·728
Millaquin	71,729	8,338	8·603	7·769
Qunaba	..	..	..	8·340
Gin Gin	23,068	2,192	10·524	7·456
Isis	45,949	4,812	9·549	7·000
Maryborough	25,597	3,077	8·319	8·952
Mount Bauple	10,167	1,131	8·989	7·436
Moreton	89,052	10,250	8·688	7·498
Rocky Piont	15,280	1,545	9·890	9·185
Local sales	..	8	..	..
Totals and averages, Southern District	445,752	50,600	8·809	7·577
Totals and averages, all Districts	3,714,475	512,086	7·254	7·062

TABLE XVI.—ADJUSTED TONNAGES OF SUGAR DEEMED TO BE MANUFACTURED FROM MILL'S OWN CANE.

Mossman	.. ..	14,795	Kalamia	.. ..	27,346	Millaquin	.. ..	6,321
Hambledon	.. ..	16,104	Inkerman	.. ..	28,652	Qunaba	.. ..	2,017
Mulgrave	.. ..	18,252	Proserpine	.. ..	12,688	Gin Gin	.. ..	2,192
Babinda	.. ..	23,681	Farleigh	.. ..	21,362	Isis	.. .. ..	4,812
Goondi	.. .. ..	17,908	Racecourse	.. ..	21,945	Maryborough	..	3,070
South Johnstone	..	26,065	Pleystowe	.. ..	22,375	Mount Bauple	..	1,138
Mourilyan	.. ..	16,266	Marian	.. ..	17,775	Moreton	.. ..	10,250
Tully	.. .. ..	29,221	Cattle Creek	.. ..	7,917	Rocky Point	.. ..	1,545
Macknade	.. ..	36,935	North Eton	.. ..	10,298	Local sales	..	51
Victoria	.. .. ..	34,497	Plane Creek	.. ..	18,693			
Invicta	.. .. ..	13,082	Bingera	.. ..	11,993	Total	..	512,086
Pioneer	.. ..	25,586	Fairymead	.. ..	7,254			

TABLE XVII.—AVERAGE CRUSHING RATES. (TONS CANE PER HOUR.) (ARITHMETIC AVERAGES.)

1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.
60·80	61·53	61·67	63·32	55·93	55·45	57·33	59·32	59·48

TOTAL CROP DAYS.

——	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.
Crop days	.. ..	4,822	5,163	4,558	4,034	4,432	4,270	4,749	4,872	3,740

TABLE XVIII.—ANALYSIS OF GROSS TIME FOR SEASON 1946.

——	——	Total Hours.	Per Cent. Gross Total Hours.	Per Cent. Available Hours.
Available for crushing	Crushing time	49,196·43	66·17	92·99
	Lost time—			
	Manufacture	1,956·13	2·63	3·70
	Cane supply	1,750·93	2·36	3·31
	Total	52,903·49	71·16	100·00
	Premeditated stops and week-ends	21,445·58	28·84	..
	Gross Total	74,349·07	100·00	..

TABLE XIX.—FUEL CALCULATED AS EQUIVALENT BAGASSE* PER 100 CANE. (ARITHMETIC AVERAGES.)

Year.	Wood.	Coal, &c.	Molasses.	Total Added.	Bagasse.	Total.
NORTHERN DISTRICT.						
1938	·368	..	1·664	2·032	23·155	25·187
1939	·557	..	1·807	2·364	21·892	24·256
1940	1·226	..	1·217	2·443	21·982	24·425
1941	1·230	..	·768	1·998	21·390	23·388
1942	1·243	..	2·276	3·519	21·637	25·156
1943	1·410	..	2·224	3·634	23·182	26·816
1944	1·063	..	1·770	2·833	22·633	25·466
1945	1·830	..	1·552	3·382	23·021	26·403
1946	2·287	..	1·088	3·375	22·858	26·233
CENTRAL DISTRICT.						
1938	1·504	·329	·542	2·375	25·317	27·692
1939	·993	·058	·646	1·697	24·743	26·440
1940	1·138	·019	·220	1·377	24·801	26·178
1941	1·106	·047	·295	1·448	24·837	26·285
1942	1·224	·046	·217	1·487	26·254	27·741
1943	2·589	·189	·198	2·976	26·163	29·139
1944	1·995	·131	·180	2·306	27·061	29·367
1945	1·372	·092	·326	1·790	28·144	29·934
1946	2·730	·132	·132	2.994	25·183	28·177
SOUTHERN DISTRICT.						
1938	4·586	·017	·012	4·615	29·855	34·470
1939	2·714	·010	..	2·724	30·011	32·735
1940	2·535	·031	·005	2·571	29·341	31·912
1941	2·659	·045	..	2·704	28·612	31·316
1942	3·197	·183	..	3·380	30·325	33·705
1943	5·385	·380	..	5·765	29·358	35·123
1944	4·306	·151	..	4·457	29·326	33·783
1945	3·565	·059	..	3·624	30·550	34·174
1946	5·693	·697	..	6·390	29·341	35·731
ALL QUEENSLAND DISTRICTS.						
1938	2·341	·137	·621	3·099	26·432	29·531
1939	1·508	·027	·692	2·227	25·956	28·183
1940	1·662	·018	·382	2·062	25·759	27·821
1941	1·695	·035	·302	2·032	25·369	27·401
1942	1·939	·084	·633	2·656	26·612	29·268
1943	3·313	·212	·613	4·138	26·598	30·736
1944	2·603	·107	·497	3·207	26·814	30·021
1945	2·218	·058	·524	2·800	27·781	30·581
1946	3·516	·270	·341	4·127	25·842	29·969

* Equivalent bagasse = bagasse with net calorific value of 3,300 B.Th.U. per lb.

By Authority: A. H. TUCKER, Government Printer, Brisbane.